

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: JOHN MAPLES Examiner #: 62294 Date: 2/5/04
Art Unit: 1745 Phone Number 301-21287 Serial Number: 101031022
Mail Box and Bldg/Room Location: Rem 6C89 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: LITHIUM THIN FILM LAMINATION TECHNOLOGY ON ELECTRODE TO INCREASE
Inventors (please provide full names): HISASHI TSUKAMOTO, BATTERY CAPACITY
CHUANANIT SINTUK

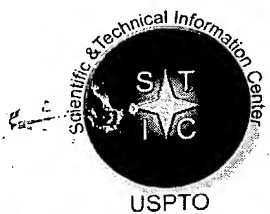
Earliest Priority Filing Date: 7/16/1999

For Sequence Searches Only Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.

1 4f

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	Type of Search	Vendors and cost where applicable
Searcher: <u>Mike Newell</u>	NA Sequence (#) _____	STN <u>458-96</u>
Searcher Phone #: <u>571-272-2538</u>	AA Sequence (#) _____	Dialog _____
Searcher Location: <u>Rem 4A30</u>	Structure (#) _____	Questel/Orbit _____
Date Searcher Picked Up: <u>2/9/04</u>	Bibliographic <u>✓</u>	Dr.Link _____
Date Completed: <u>2/10/04</u>	Litigation _____	Lexis/Nexis _____
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Clerical Prep Time: _____	Patent Family _____	WWW/Internet _____
Online Time: <u>90</u>	Other _____	Other (specify) _____



STIC Search Report

EIC 1700

STIC Database Tracking Number: 113646

TO: John Maples
Location: REM 6C89
Art Unit : 1745
February 10, 2004

Case Serial Number: 10/031022

From: Michael Newell
Location: EIC 1700
REMSEN 4A30
Phone: 571/272-2538
MNewell@uspto.gov

Search Notes



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EIC17000

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Kathleen Fuller, EIC 1700 Team Leader
571/272-2505 REMSEN 4B28

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➤ Relevant prior art **found**, search results used as follows:

- ☐ 102 rejection
- ☐ 103 rejection
- ☐ Cited as being of interest.
- ☐ Helped examiner better understand the invention.
- ☐ Helped examiner better understand the state of the art in their technology.

Types of relevant prior art found:

- ☐ Foreign Patent(s)
- ☐ Non-Patent Literature
(journal articles, conference proceedings, new product announcements etc.)

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- ☐ Results verified the lack of relevant prior art (helped determine patentability).
- ☐ Results were not useful in determining patentability or understanding the invention.

Comments:

Drop off or send completed forms to EIC1700 REMSEN 4B28



SEARCH REQUEST FORM

FEB 5

Scientific and Technical Information Center

Pat. & T.M. Office

Requester's Full Name: JOHN MAPLES Examiner #: 62294 Date: 2/5/04
Art Unit: 1745 Phone Number 301-287 Serial Number: 10/031,022
Mail Box and Bldg/Room Location: Room 6C89 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: LITHIUM THIN FILM LAMINATION TECHNOLOGY AN ELECTRODE TO INCREASE
Inventors (please provide full names): HISASHI TSUKAMOTO, BATTERY CAPACITY
CHANANIT SINTU

Earliest Priority Filing Date: 7/16/1999

**For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

A method ~~for increasing the storage capacity of a lithium ion battery~~
to laminate lithium onto an electrode
including the steps of:

- (a) providing an electrode structure comprised of a metal substrate coated with active material; and
- (b) depositing lithium onto or into said active material to reduce cavities therein; wherein said depositing step includes:
 - (b1) providing a sheet carrier bearing a layer of lithium metal; and
 - (b2) pressing said layer of lithium metal against said active material to transfer lithium onto or into said active material.

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(FILE 'HOME' ENTERED AT 13:15:42 ON 10 FEB 2004)

FILE 'REGISTRY' ENTERED AT 13:16:10 ON 10 FEB 2004
E LITHIUM/CN

L1 1 SEA LITHIUM/CN

FILE 'HCAPLUS' ENTERED AT 13:16:32 ON 10 FEB 2004

L2 73353 SEA L1

L3 832219 SEA ELECTROD## OR ANOD## OR CATHOD## OR BATTERY OR
BATTERIES OR (PRIMARY OR SECONDARY OR FUEL OR ELECTROCHEM
?) (2A) (CELL OR CELLS)

L4 351408 SEA LITHIUM OR LI OR L2

L5 11180 SEA (LITHIUM OR LI OR L2) (2A) METAL?

L6 2829977 SEA DEPOSIT? OR LAMINAT? OR LAYER? OR TRANSFER? OR
ADHERE?

L7 2508373 SEA FILM? OR THIN(W) FILM? OR THINFILM? OR LAYER? OR
LAMIN? OR LAMEL? OR MULTILAYER? OR MULTIPLE(W) LAYER? OR
SHEET? OR FOIL?

L8 34050 SEA CAPACITY(3A) (IMPROV? OR INCREAS? OR ENHANC? OR
RAISE?)

L9 5630 SEA (CAVITY OR CAVITIES OR WRINKL? OR PIT OR PITS OR
PITTING) (3A) (REDUC? OR REDN# OR PREVENT? OR LESSEN? OR
ELIMINAT? OR BLOCK? OR PROTECT?)

L10 37907 SEA L3 (5A) L4

L11 2628 SEA L10 (5A) L6

L12 48 SEA L11 AND L8

L13 0 SEA L11 AND L9

L14 3 SEA L11 AND (CAVITY OR CAVITIES)
D SCAN

L15 48 SEA L12 AND (52/SC, SX OR 72/SC, SX)

L16 22 SEA L12 AND H01M/IPC

L17 26 SEA L15 NOT L16

L18 461 SEA L11 AND CAPACITY

L19 413 SEA L18 NOT L12

L20 404 SEA L19 AND (72/SC,SX OR 52/SC,SX)
L21 177 SEA L20 AND H01M/IPC
L22 128 SEA L21 AND (1907-1999/PY OR 1907-1999/PRY)
L23 23 SEA L22 AND LAMINAT?
L24 71 SEA L16 OR L17 OR L23

D SCAN TI

L*** DEL 0 S L24 AND H01M6/00/IPC

L*** DEL 0 S L24 AND H01M600/IPC

L*** DEL 0 S L24 AND H01M6/IPC

D SCAN TI L23

L25 0 SEA L24 AND (CAVITY OR CAVITIES)

FILE 'WPIX, JAPIO' ENTERED AT 13:48:17 ON 10 FEB 2004

L26 28700 SEA L3 (5A) L4
L27 6606 SEA L26 AND L6
L28 3526 SEA L27 AND SECONDARY
L29 208 SEA L28 AND L8
L30 856 SEA L28 AND LAMINAT?
L31 238 SEA L28 AND LAMINAT?/TI
L32 3015 SEA L27 AND SECONDARY/TI
L33 15 SEA L31 AND L5
L34 472 SEA L32 AND L5
L35 466 SEA L34 AND (LITHIUM/TI OR (BATTERY OR BATTERIES)/TI)
D SCAN TI L33
D SCAN L33
L36 83 SEA L35 AND (FOIL? OR SHEET?)
L37 19 SEA L35 AND (FOIL? OR SHEET?)/TI
D SCAN
L38 32 SEA L33 OR L37

FILE 'HCAPLUS, WPIX, JAPIO' ENTERED AT 14:01:33 ON 10 FEB 2004

FILE HOME

FILE REGISTRY

Property values tagged with IC are from the ZIC/VINITI data file
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STRUCTURE FILE UPDATES: 9 FEB 2004 HIGHEST RN 648407-44-7
DICTIONARY FILE UPDATES: 9 FEB 2004 HIGHEST RN 648407-44-7

TSCA INFORMATION NOW CURRENT THROUGH JULY 14, 2003

Please note that search-term pricing does apply when
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Crossover limits have been increased. See HELP CROSSOVER for detail

Experimental and calculated property data are now available. For more information enter HELP PROP at an arrow prompt in the file or refer to the file summary sheet on the web at:
<http://www.cas.org/ONLINE/DBSS/registryss.html>

FILE HCAPLUS

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FILE COVERS 1907 - 10 Feb 2004 VOL 140 ISS 7
FILE LAST UPDATED: 9 Feb 2004 (20040209/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

FILE WPIX
FILE LAST UPDATED: 5 FEB 2004 <20040205/UP>
MOST RECENT DERWENT UPDATE: 200409 <200409/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

>>> NEW WEEKLY SDI FREQUENCY AVAILABLE --> see NEWS <<<

>>> SLART (Simultaneous Left and Right Truncation) is now available in the /ABEX field. An additional search field /BIX is also provided which comprises both /BI and /ABEX <<<

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FILE JAPIO

FILE LAST UPDATED: 3 FEB 2004 <20040203/UP>

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<<< GRAPHIC IMAGES AVAILABLE >>>

=> d 124 cbib abs hitstr hitind 1-71

L24 ANSWER 1 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2004:54765 Document No. 140:79752 Effects of molybdenum doping on the
layered $\text{Li}[\text{Ni}_{0.5}\text{xMn}_{0.5-2\text{xMox}}]\text{O}_2$ cathode materials for lithium
secondary batteries. Park, Sang Ho; Oh, Sung Woo; Kang, Sung Goon;
Myung, Seung-taek; Sun, Yang-kook (Department of Chemical
Engineering, Hanyang University, Seoul, 133-791, S. Korea).
Chemistry Letters, 33(1), 2-3 (English) 2004. CODEN: CMLTAG. ISSN:
0366-7022. Publisher: Chemical Society of Japan.

AB Mo-doped layered $\text{Li}[\text{Ni}_{0.5}\text{xMn}_{0.5-2\text{xMox}}]\text{O}_2$ materials were synthesized
by ultrasonic spray pyrolysis. Single phases of
 $\text{Li}[\text{Ni}_{0.5}\text{xMn}_{0.5-2\text{xMox}}]\text{O}_2$ were prepd. for $0 < x < 0.05$. Structural
and electrochem. properties of $\text{Li}[\text{Ni}_{0.5}\text{xMn}_{0.5-2\text{xMox}}]\text{O}_2$ were
obtained by XRD, Rietveld refinement, and galvanostatic
charge/discharge tests. The discharge **capacity**
increased linearly with an increase in Mo content and a high
discharge capacity of $>175 \text{ mA-h/g}$ between 2.8 and 4.4 V was obtained
with good capacity retention.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)

IT Secondary **batteries**
(lithium; effect of molybdenum doping on
layered $\text{Li}[\text{Ni}_{0.5}\text{xMn}_{0.5-2\text{xMox}}]\text{O}_2$ cathode materials for
lithium secondary batteries)

L24 ANSWER 2 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2003:974329 Synthesis and structural characterization of **layered**
 $\text{Li}[\text{Ni}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}]\text{O}_2$ cathode materials by
ultrasonic spray pyrolysis method. Park, S. H.; Yoon, C. S.; Kang,
S. G.; Kim, H.-S.; Moon, S.-I.; Sun, Y.-K. (Department of Chemical
Engineering, Hanyang University, Seungdong-Gu, Seoul, 133-791, S.
Korea). Electrochimica Acta, 49(4), 557-563 (English) 2004. CODEN:

ELCAAV. ISSN: 0013-4686. Publisher: Elsevier Science B.V..

- AB The layered $\text{Li}[\text{Ni}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}]\text{O}_2$ materials were synthesized by a spray pyrolysis method using citric acid as a polymeric agent. The $\text{Li}[\text{Ni}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}]\text{O}_2$ powders were characterized by means of X-ray diffraction (XRD), charge/discharge cycling, cyclic voltammetry, and high-resoln. transmission electron microscopy (TEM). The discharge **capacity increases** linearly with the increase of the upper cut-off voltage limit. TEM anal. showed that particles in the as-prepd. powder possessed a polycryst. structure. During cycling, the particle structure is mostly preserved although some surface grains on the polycryst. particle became sepd. and transformed to the spinel phase.

CC 72 (Electrochemistry)

L24 ANSWER 3 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2003:900603 Electrochemical properties of **layered Li** $[\text{Ni}_{1/2}\text{Mn}_{1/2}]\text{O}_2$ **cathode** material synthesised by ultrasonic spray pyrolysis. Park, S. H.; Lee, Y. S.; Sato, Y.; Sun, Y.-K. (Department of Chemical Engineering, Hanyang University, Seoul, 133-791, S. Korea). Journal of Applied Electrochemistry, 33(12), 1169-1173 (English) 2003. CODEN: JAELEBJ. ISSN: 0021-891X. Publisher: Kluwer Academic Publishers.

- AB Layered $\text{Li}[\text{Ni}_{1/2}\text{Mn}_{1/2}]\text{O}_2$ was synthesized by an ultrasonic spray pyrolysis method. The $\text{Li}[\text{Ni}_{1/2}\text{Mn}_{1/2}]\text{O}_2$ powder was characterized by means of X-ray diffraction, charge/discharge test, and cyclic voltammetry. The discharge **capacity increases** linearly with **increase** of the upper cut-off voltage limit and attains a high discharge capacity of 187 mA h g⁻¹ between 2.8 and 4.6 V with excellent cyclability. A cyclic voltammetric study of the $\text{Li}[\text{Ni}_{1/2}\text{Mn}_{1/2}]\text{O}_2$ electrode showed only one redox peak implying no structural phase change during cycling.

CC 72 (Electrochemistry)

L24 ANSWER 4 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2003:553786 Document No. 139:309939 The electrochemical properties of $\text{AgxCu}_y\text{V}_{205}$ xerogel for lithium secondary batteries. Park, Heai-Ku; Kim, Yong-Woo; Lee, Man-Ho; Paik, Seunguk (Department of Chemical System Engineering, College of Engineering, Keimyung University, S. Korea). Kongop Hwahak, 14(4), 481-486 (Korean) 2003. CODEN: KOHWE9. ISSN: 1225-0112. Publisher: Korean Society of Industrial and Engineering Chemistry.

- AB In order to improve the properties of vanadium oxide as cathodes, $\text{AgxCu}_y\text{V}_{205}$ gel was synthesized by deliberately adding a small amt. of Ag and Cu to a V_{205} sol derived via sol-gel process. The electrochem. properties of a new mixed oxide $\text{AgxCu}_y\text{V}_{205}$ xerogel as a Li intercalation compd. have been investigated in the relation with structural characteristics. It appeared the amorphous layered material and entangled fibrous textures have been grown to form

anisotropic corrugated fibrils. The specific capacity and rate characteristics were dependent upon the added amt. of dopant, Cu and Ag. Av. specific capacity of the $\text{AgxCu}_y\text{V}_2\text{O}_5$ xerogel was more than 120 mAh/g, and coulombic efficiency was at least ninety percent. The overall electrochem. properties, the reversibility and cell **capacity**, were **enhanced** compared to the undoped vanadium pentoxide.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 57, 72

IT Electron transfer

(charge **transfer** resistance of $\text{AgxCu}_y\text{V}_2\text{O}_5$ xerogel for **lithium** secondary **batteries**)

L24 ANSWER 5 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2003:437407 Document No. 139:278921 Comparative study of

$\text{Li}(\text{Ni}_{0.5-x}\text{Mn}_{0.5-x}\text{M}'_2\text{x}')\text{O}_2$ ($\text{M}' = \text{Mg, Al, Co, Ni, Ti; } x = 0, 0.025$) cathode materials for rechargeable lithium batteries. Kang, S.-H.; Amine, K. (Chemical Technology Division, Electrochemical Technology Program, Argonne National Laboratory, Argonne, IL, 60439, USA). Journal of Power Sources, 119-121, 150-155 (English) 2003. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science B.V..

AB The effect of dopants on the electrochem. and thermal properties of layered $\text{Li}(\text{Ni}_{0.5-x}\text{Mn}_{0.5-x}\text{M}'_2\text{x}')\text{O}_2$ materials with $\text{M}' = \text{Mg, Al, Co, Ni, Ti}$ and $x = 0, 0.025$, prep'd. by using a Mn-Ni hydroxide precursor, was studied. $\text{Li}(\text{Ni}_{0.5}\text{Mn}_{0.5})\text{O}_2$ exhibited discharge capacities of .apprx.120 and 150 mA-h/g at 2.8-4.3 and 2.8-4.6 V, resp., with some capacity fading. The addn. of 5 mol% Al, Co, Ni, or Ti **increased** the discharge **capacity** by 10-30% and **improved capacity** retention. XPS data suggested that Ni and Mn exist as Ni^{2+} and Mn^{4+} so that only Ni is electrochem. active in the layered structure. DSC data showed that exothermic reactions of $\text{Li}_y(\text{Ni}_{0.5-x}\text{Mn}_{0.5-x}\text{M}'_2\text{x}')\text{O}_2$ charged to 4.3 V vs. Li started at higher temps. (270-290.degree.) than LiNiO_2 -based cathode materials (e.g. 200.degree. for $\text{LiNi}_{0.8}\text{Co}_{0.2}\text{O}_2$), which indicates that the thermal stability of $\text{Li}(\text{Ni}_{0.5-x}\text{Mn}_{0.5-x}\text{M}'_2\text{x}')\text{O}_2$ is superior to that of LiNiO_2 -based cathode materials.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 72

ST **lithium** manganese nickel doped **layered** oxide **cathode lithium battery**

L24 ANSWER 6 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2003:154982 Document No. 138:190737 Lithium-ion secondary battery

using a metal oxide electrode coated with a porous metal film, a metal oxide film, or a carbon film. Yun, Kyung-Suk; Cho, Byung-Won; Cho, Won-Ii; Kim, Hyung-Sun; Kim, Un-Seok; Nam, Sang-Cheol; Lee,

Seung-Won; Yoon, Young-Soo (S. Korea). U.S. Pat. Appl. Publ. US 2003039887 A1 20030227, 8 pp. (English). CODEN: USXXCO.
APPLICATION: US 2001-934648 20010823.

- AB A metal oxide electrode coated with a porous metal film, a metal oxide film or a carbon film, its fabrication method and a lithium-ion secondary battery using it are disclosed. The porous thin film of Li, Al, Sn, Bi, Si, Sb, Ni, Cu, Ti, V, Cr, Mn, Fe, Co, Zn, Mo, W, Ag, Au, Pt, Ir, Ru, carbon or their alloys are coated to a few .ANG., a few .mu.m, so as to remarkably **improve** the **capacity** of a battery, high rate charging and discharging characteristics and a durability characteristics. The method can be applied to a fabrication of every secondary battery.
- IC ICM H01M004-62
ICS B05D005-12; H01M004-48; H01M004-52
- NCL 429218100; 429246000; 429231100; 429231300; 429223000; 429224000;
429231500; 429231800; 427124000
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- IT Vapor deposition process
(ion plating, ion line **deposition**; lithium
-ion secondary **battery** using metal oxide electrode
coated with porous metal film, metal oxide film, or carbon film)
- IT Vapor **deposition** process
(laser ablation; lithium-ion secondary **battery**
using metal oxide electrode coated with porous metal film, metal
oxide film, or carbon film)

- L24 ANSWER 7 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2002:983187 Document No. 138:323925 Electrochemical studies of nanoncrystalline Mg₂Si thin film electrodes prepared by pulsed laser deposition. Song, Seung-Wan; Striebel, Kathryn A.; Reade, Ronald P.; Roberts, Gregory A.; Cairns, Elton J. (Environmental Energy Technologies Division, Ernest Orlando Lawrence Berkeley National Laboratory, Berkeley, CA, 94720, USA). Journal of the Electrochemical Society, 150(1), A121-A127 (English) 2003. CODEN: JESOAN. ISSN: 0013-4651. Publisher: Electrochemical Society.
- AB Electrochem. active thin films of Mg₂Si in various film thicknesses of 30-380 nm have been prepd. with the pulsed laser deposition technique. The thinnest film of 30 nm showed a highly stable cycling behavior at 0.1-1.0 V vs. Li, delivering capacity greater than 2000 mAh/g for more than 100 cycles. Though the film morphol. became remarkably rougher with cycling, the films showed good stability. However, the first cycle irreversible **capacity** loss **increased** with film thickness. Therefore, lithium adsorption/desorption reaction forming Li-Si alloy at the Si-rich film surface is suggested as one of the sources of the large capacity of the 30 nm film. The superior capacity retention, when compared to porous electrodes of this alloy, may be attributed to a limited structural vol. change in the two-dimensional film, shorter

lithium diffusion path and enhanced cond. from stainless steel substrate. The goals of this study are to promote the emerging need of thin film anodes for all solid-state microbatteries and clarify the capacity failure of powder intermetallic anodes for rechargeable lithium batteries.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Battery anodes

Nanocrystalline materials

(electrochem. studies of nanoncryst. Mg₂Si thin film

electrodes for lithium batteries

prepd. by pulsed laser **deposition**)

IT Secondary batteries

(lithium; electrochem. studies of nanoncryst. Mg₂Si thin film

electrodes for lithium batteries

prepd. by pulsed laser **deposition**)

IT Diffusion

Intercalation

(of lithium; electrochem. studies of nanoncryst. Mg₂Si thin film

electrodes for lithium batteries

prepd. by pulsed laser **deposition**)

IT 7439-93-2, Lithium, properties

(absorption-desorption and diffusivity of of; electrochem.

studies of nanoncryst. Mg₂Si thin film **electrodes for**

lithium batteries prepd. by pulsed laser

deposition)

IT 22831-39-6, Magnesium silicide Mg₂Si

(electrochem. studies of nanoncryst. Mg₂Si thin film

electrodes for lithium batteries

prepd. by pulsed laser **deposition**)

IT 146296-28-8, Lithium magnesium silicide Li₂MgSi

(lithium absorption product; electrochem. studies of nanoncryst.

Mg₂Si thin film **electrodes for lithium**

batteries prepd. by pulsed laser **deposition**)

L24 ANSWER 8 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2002:925365 Document No. 138:15243 lithium secondary battery with carbon fiber electrode material. Yanagisawa, Takashi; Endo, Morinobu; Lake, Max Laverne; Higaki, Shunji (GSI Creos Corporation, Japan). Eur. Pat. Appl. EP 1262579 A2 20021204, 26 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR. (English). CODEN: EPXXDW. APPLICATION: EP 2002-6395 20020321. PRIORITY: JP 2001-162185 20010530; JP 2001-260430 20010829.

AB Electrode material for lithium secondary battery, and lithium secondary battery using the same. An electrode material for a secondary battery has a carbon fiber. This carbon fiber has a coaxial stacking morphol. of truncated conical tubular graphene

layers, wherein each of the truncated conical tubular graphene layers includes a hexagonal carbon layer, and has a large ring end at one end and a small ring end at the other end in an axial direction. The hexagonal carbon layers are exposed on at least a part of the large ring ends. Such an electrode material for a secondary battery excels in lifetime performance, has a large elec. energy d., enables an **increase in capacity**, and excels in cond. and electrode reinforcement. This carbon fiber may be used as a cathode material (additive to an electrode) and an anode material (essential material or additive to an electrode) of lithium secondary batteries.

IC ICM D01F009-127

ICS H01M004-58

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 49

IT 7439-93-2, Lithium, processes

(intercalation between hexagonal carbon **layers**;
lithium secondary **battery** with carbon fiber
electrode material)

L24 ANSWER 9 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2002:900567 Document No. 138:6431 Manufacture of **layered**

rock-salt structured **lithium** iron oxide for secondary

batteries. Kitagawa, Yukiko; Shigemura, Akisato; Ebe,

Hikari; Kobayashi, Hironori; Kageyama, Hiroyuki; Kanno, Ryoji;

Tabuchi, Mitsuharu (Ministry of Economy, Trade and Industry;

National Industrial Research Institute, Japan). Jpn. Kokai Tokkyo

Koho JP 2002338251 A2 20021127, 5 pp. (Japanese). CODEN: JKXXAF.

APPLICATION: JP 2001-150534 20010521.

AB The title oxides having a formula of $\text{LiFe}_{1-x}\text{Ni}_x\text{O}_2$ ($0 < x < 0.5$) and a layered rock-salt crystal structure are manufd. by treating a soln. contg. Fe^{+3} and Ni^{+2} with alkali, air-oxidizing the formed ppt., aging the oxide in .ltoreq.100.degree., and hydrothermal-treating the aged oxide at .ltoreq.400.degree. in an alkali soln. (calcium hydroxide) contg. a Li compd. The title oxide is useful as cathode material for the lithium secondary battery with **improved** initial charge-discharge **capacity**.

IC ICM C01G053-00

ICS C01G049-00; H01M004-02; H01M010-40;

H01M004-58

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Battery cathodes

Secondary batteries

(manuf. of **layered** rock-salt structure **lithium**
iron oxide for secondary **batteries**)

IT 39336-10-2P, Iron lithium nickel oxide 185429-51-0P, Iron lithium
nickel oxide $\text{Fe}_{0.9}\text{LiNi}_{0.1}\text{O}_2$

(manuf. of **layered** rock-salt structure **lithium**

iron oxide for secondary **batteries**)

IT 1305-62-0, Calcium hydroxide, uses
(manuf. of **layered** rock-salt structure **lithium**
iron oxide for secondary **batteries**)

L24 ANSWER 10 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2002:900565 Document No. 138:6430 Manufacture of **layered**
rock-salt structure **lithium** iron oxide for secondary
batteries. Kitagawa, Yukiko; Shigemura, Akisato; Sakabe,
Hikari; Kobayashi, Hironori; Kageyama, Hiroyuki; Kanno, Ryoji;
Tabuchi, Mitsuharu (Ministry of Economy, Trade and Industry;
National Industrial Research Institute, Japan). Jpn. Kokai Tokkyo
Koho JP 2002338248 A2 20021127, 5 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 2001-150532 20010521.

AB The title oxides having a formula of $\text{LiFe}_{1-x}\text{Mn}_x\text{O}_2$ ($0 < x < 0.5$) and a
layered rock-salt crystal structure are manufd. by treating a soln.
contg. Fe^{+3} and Mn^{+2} with alkali, air-oxidizing the formed ppt., aging
the oxide in .ltoreq.100.degree., and hydrothermal-treating the aged
oxide at .ltoreq.400.degree. in an alkali soln. (calcium hydroxide)
contg. a Li compd. The title oxide is useful as the cathode
material for the lithium ion secondary battery with **improved**
initial charge-discharge **capacity**.

IC ICM C01G049-00

ICS H01M004-02; H01M004-58; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Battery cathodes

Secondary batteries

(manuf. of **layered** rock-salt structure **lithium**

iron oxide for secondary **batteries**)

IT 53027-29-5P, Iron lithium manganese oxide 152060-87-2P, Iron
lithium manganese oxide $\text{Fe}_{0.9}\text{LiMn}_{0.1}\text{O}_2$

(manuf. of **layered** rock-salt structure **lithium**

iron oxide for secondary **batteries**)

L24 ANSWER 11 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2002:616019 Document No. 137:172397 Rechargeable lithium battery using
punched electrode. Kim, Soo-Ryoung; Kim, Jee-Ho; Byun, Ho-Kyung;
Kim, Yong-Rae (LG Chem, Ltd., S. Korea). PCT Int. Appl. WO
2002063705 A1 20020815, 19 pp. DESIGNATED STATES: W: CN, JP, US;
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL,
PT, SE, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-KR158
20020204. PRIORITY: KR 2001-5731 20010206.

AB The present invention relates to a punched electrode and a
rechargeable lithium battery using the same, and more particularly
to a punched electrode and a rechargeable lithium battery using the
same that can **improve** cycle life, **capacity**, and
safety characteristics of the battery. The present invention can
improve cycle life, **capacity**, and rate

characteristics etc. of the battery by making the impregnation rate of an electrolyte higher and by uniformly controlling the impregnation degree, and it can improve safety properties of the **battery** by preventing **lithium deposition** such that a uniform **electrode** reaction occurs, through punching out a hole in an anode, an anode/cathode, or an anode/cathode/separator of an electrode group that comprises the inner part of the lithium secondary battery.

IC ICM H01M004-80

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 12 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2002:558430 Document No. 137:313446 High-pressure synthesis of Ga-substituted LiCoO₂ with layered crystal structure. Stoyanova, Radostina; Zhecheva, Ekaterina; Bromiley, Geoffrey; Ballaran, Tiziana Boffa; Alcantara, Ricardo; Corredor, Juan-Isidro; Tirado, Jose-Luis (Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences, Sofia, 1113, Bulg.). Journal of Materials Chemistry, 12(8), 2501-2506 (English) 2002. CODEN: JMACEP. ISSN: 0959-9428. Publisher: Royal Society of Chemistry.

AB LiGayCo_{1-y}O₂ solid solns. with a layered crystal structure (0.1 < y < 0.75) were prepd. under high pressure (3 GPa) at 850.degree. using a piston-cylinder type app. This is in contrast to the soly. of Ga in the layered LiCoO₂ structure at atm. pressure, which is strongly limited, and reaches a max. value of y = 0.1 at 700.degree.. The structure of Ga-substituted LiCoO₂ is characterized by x-ray diffraction anal. and IR spectroscopy. It has been found that Ga substitutes Co in the CoO₂ layer (3a site), while Li and O are in their normal positions (3b and 6c, resp.). The progressive replacement of Co by Ga leads to a linear increase in the mean M-O bond distance and to a smooth decrease in frequency of the main vibration of the GayCo_{1-y}O₂ layer, thus indicating a random Co/Ga distribution. The electrochem. performance of LiGayCo_{1-y}O₂ as a cathode material in lithium-ion cells has been evaluated in potentiostatic and galvanostatic expts. The deintercalation voltage of the LiGayCo_{1-y}O₂ solid solns. **increases** and the reversible **capacity** decreases with **increasing** gallium content.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Battery cathodes

(high-pressure synthesis of LiGayCo_{1-y}O₂ with **layered** crystal structure for use as **cathode** in **lithium** -ion batteries)

IT 12190-79-3, Cobalt lithium oxide (CoLiO₂) 198213-60-4, Cobalt gallium lithium oxide (Co_{0.95}Ga_{0.05}LiO₂) 221332-84-9, Cobalt gallium lithium oxide (Co_{0.9}Ga_{0.1}LiO₂) 471913-87-8, Cobalt gallium lithium oxide (Co_{0.75}Ga_{0.25}LiO₂) 471913-88-9, Cobalt gallium

lithium oxide ($\text{Co}_{0.5}\text{Ga}_{0.5}\text{LiO}_2$) 471913-89-0, Cobalt gallium lithium oxide ($\text{Co}_{0.25}\text{Ga}_{0.75}\text{LiO}_2$)

(high-pressure synthesis of $\text{LiGa}_{1-y}\text{Co}_y\text{O}_2$ with **layered** crystal structure for use as **cathode** in **lithium** -ion batteries)

L24 ANSWER 13 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2002:395293 Document No. 137:188158 Unusual overcharge tolerance behavior in gelled polymer lithium ion cells. Xing, Weibing (Electrochem-Canton, Wilson Greatbatch Technologies, Canton, MA, 02021, USA). Journal of Power Sources, 109(1), 167-171 (English) 2002. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science B.V..

AB Unusual overcharge tolerance behavior was obsd. in polymer lithium-ion cells. The cells could be overcharged up to several times the nominal **capacity** without a significant **increase** in cell potential. Exptl. studies were carried out to understand this phenomenon. Cyclic voltammograms on gelled solid polymer electrolytes indicated that this phenomenon did not originate from an oxidn.-redn. shuttle mechanism. A correlation between the apparent overcharge tolerance capability and anode to cathode capacity ratio was found. This observation suggested that the obsd. overcharge tolerance behavior was caused by non-dendritic **lithium deposition** on the carbon **anode** surface during overcharge. It was hypothesized that this lithium deposition created some weak electronic conducting paths through which part of the overcharge current was bypassed. Results of surface analyses on both fully charged and overcharged anodes were consistent with the above hypothesis.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 14 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2002:291129 Document No. 137:35440 Structural and Electrochemical Characterization of the $\text{LiNi}_{1-y}\text{Ti}_y\text{O}_2$ Electrode Materials Obtained by Direct Solid-State Reactions. Croguennec, L.; Suard, E.; Willmann, P.; Delmas, C. (Institut de Chimie de la Matiere Condensee de Bordeaux, CNRS and Ecole Nationale Supérieure de Chimie et Physique de Bordeaux, Pessac, 33608, Fr.). Chemistry of Materials, 14(5), 2149-2157 (English) 2002. CODEN: CMATEX. ISSN: 0897-4756. Publisher: American Chemical Society.

AB $\text{LiNi}_{1-y}\text{Ti}_y\text{O}_2$ (y .ltoreq. 0.15) layered oxides were synthesized at high temp. by solid-state reactions. Rietveld refinements of their X-ray and neutron diffraction patterns showed that these phases were characterized by an α - NaFeO_2 -type structure with the following cationic distribution: $(\text{Li}_{1-z}\text{Ni}_{2+z})_3\text{b}(\text{Ti}_{4+t}\text{Ni}_{2+t+z}\text{Ni}_{3+1-z-2t})_3\text{aO}_2$ [$t = y(1 + z)$]. The amt. of Ni^{2+} ions in the lithium site increases with y . A magnetic study confirmed the presence of paramagnetic

ions in the interslab space and, therefore, the cationic distribution. These materials used as pos. electrode in lithium batteries show reversible behavior. A large decrease of the **capacity** is obsd. with **increasing** y , because of the presence of extra nickel ions in the lithium sites. For the "Li_xNi_{0.95}Ti_{0.05}O₂" compn., 144 mA h/g are obtained in discharge at the 14th cycle at the C/20 rate. The "Li_xNi_{1-y}Ti_yO₂" phases were characterized for $y = 0.05$ and 0.10 : the simultaneous presence of titanium ions in the slab and of a significant amt. of extra nickel ions in the lithium sites prevents phase transitions upon cycling.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 49, 72

IT Inorganic compounds

(**layered**; structural and electrochem. characterization of Li-Ni-Ti oxide **electrode** materials obtained by direct solid-state reactions)

L24 ANSWER 15 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2002:288161 Document No. 137:111601 Nanotubes as anode material for lithium-ion batteries. Loutfy, Raouf O.; Hossain, S.; Moravsky, A.; Saleh, M. (MER Corporation, Tucson, AZ, USA). Perspectives of Fullerene Nanotechnology, 341-355. Editor(s): Osawa, Eiji. Kluwer Academic Publishers: Dordrecht, Neth. ISBN: 0-7923-7174-7 (English) 2002. CODEN: 69CLLN.

AB Carbon nanotubes including arc multi-walled nanotubes (arc-MWNT), arc- and laser-produced single-walled nanotubes (SWNT), and catalytically grown multi-walled nanotubes (vapor grown, VG MWNT, and chem. vapor **deposited**, CVD MWNT) were investigated as **anode** materials for lithium ion intercalation and de-intercalation. As-produced arc-MWNT deliver capacity in the range of 190-210 mA-h/g and an irreversible capacity in the range of 90-140 mA-h/g. The reversible **capacity improved** to 310-340 mA-h/g with purifn. and opening of the ends of the tubes. SWNT delivered relatively high reversible capacity of >600 mA-h/g but they were assocd. with very high irreversible capacity (.apprx.200%) that makes these materials impractical to use as an anode material for lithium batteries. Vapor-grown nanofibers exhibited poor reversible capacity and also very high irreversible capacity. On the other hand, CVD MWNT delivered >400 mA-h/g reversible capacity with relatively low irreversible capacity (<25%).

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 16 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2002:241434 Document No. 137:127456 Overcharge tolerance phenomenon in polymer lithium ion cells. Xing, Weibing (Division of Wilson

Greatbatch Technologies, Electrochem-Canton, Canton, MA, 02021, USA). Annual Battery Conference on Applications and Advances, 17th, Long Beach, CA, United States, Jan. 15-18, 2002, 191-194. Editor(s): Das, Radhe S. L.; Frank, Harvey. Institute of Electrical and Electronics Engineers: New York, N. Y. ISBN: 0-7803-7132-1 (English) 2002. CODEN: 69CKHG.

- AB An unusual overcharge tolerance phenomenon was obsd. in polymer lithium-ion cells. The cells could be overcharged up to several times of the nominal **capacity** without a significant **increase** in cell potential. Exptl. studies were carried out to understand this phenomenon. Cyclic voltammograms on gelled solid polymer electrolytes indicated that this phenomenon did not originate from oxidn.-redn. shuttle mechanism. A correlation between the apparent overcharge tolerance capability and anode to cathode capacity ratios was found. This observation suggested that a portion of the overcharge current was bypassed by a weak electronic conducting path assocd. with non-dendritic **lithium deposition** on carbon **anode** surfaces during overcharge.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 17 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2002:193284 Document No. 136:234677 Mixed oxide-based cathode active materials, their manufacture, and secondary lithium batteries using them. Odakawa, Kenji; Kurasawa, Tatsuhiko (Mitsui Chemicals Inc., Japan). Jpn. Kokai Tokkyo Koho JP 2002075367 A2 20020315, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-267275 20000904.

- AB The **cathode** active materials comprise Li+-intercalatable **Li** mixed oxide powders having surface **layers** contg. Mo and/or W and Li. The materials are manufd. by heating mixts. of Li+-intercalatable mixed oxide powders contg. Co, Ni, and/or Mn and Li and mixed oxides contg. Mo and/or W and Li at approx. 650-950.degree.. Secondary Li+ batteries using the cathode active materials show high initial discharge **capacity** and **improved** thermal stability in the charged state.

IC ICM H01M004-58

ICS C01G053-00; H01M004-02; H01M010-40

- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 18 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2001:848928 Document No. 136:125383 **Layered Li** [NixCo1-2xMnx]O2 **cathode** materials for lithium -ion batteries. Lu, Zhonghua; MacNeil, D. D.; Dahn, J. R. (Department of Physics, Dalhousie University, Halifax, NS, B3H 3J5, Can.). Electrochemical and Solid-State Letters, 4(12), A200-A203 (English) 2001. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.

- AB The structure and electrochem. behavior of $\text{Li}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$ with $x = 1/4$ and $3/8$ is reported for the first time. $\text{Li}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$ ($0 \leq x \leq 1/2$) is prepd. by the simultaneous substitution of Ni^{2+} and Mn^{4+} (1:1) for Co^{3+} in LiCoO_2 . X-ray diffraction patterns show these materials have a layered $\alpha\text{-NaFeO}_2$ -type structure. Both $\text{Li}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$ with $x = 1/4$ or $3/8$ can deliver a stable capacity of about 160 mAh/g between 2.5 and 4.4 V vs. Li using a specific current of 40 mA/g. If the upper potential of $\text{Li}/\text{Li}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$ cells with $x = 3/8$ is reduced to 4.2 V vs. Li, its **capacity** retention behavior is **improved** and it gives a capacity of 136 mAh/g, which is very close to that of LiCoO_2 in the same potential window. Studies of the thermal stability of $\text{Li}_{1-y}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$ in electrolyte using differential scanning calorimetry indicate that the samples with $x = 1/4$ and $x = 3/8$ are more thermally stable than LiCoO_2 .
- CC 72-2 (Electrochemistry)
Section cross-reference(s): 52, 57, 75
- ST **layered** cobalt **lithium** manganese nickel oxide
cathode secondary **battery**; thermal stability
layered cobalt lithium manganese nickel oxide
- IT X-ray diffraction
(by **layered** $\text{Li}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$
cathode materials for **lithium-ion** batteries)
- IT **Cathodes**
Secondary **batteries**
(**layered** $\text{Li}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$ **cathode**
materials for **lithium-ion** batteries)
- IT Crystal structure
Electric capacitance
Thermal decomposition
Thermal stability
(of **layered** $\text{Li}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$
cathode materials for **lithium-ion** batteries)
- IT Reaction enthalpy
(of thermal decompn. of **layered** Li
 $[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$ **cathode** materials for **lithium**
-ion batteries)
- IT 390362-01-3P, Cobalt lithium manganese nickel oxide
($\text{Co}_{0.5}\text{LiMn}_{0.25}\text{Ni}_{0.25}\text{O}_2$) 390362-04-6P, Cobalt lithium manganese
nickel oxide ($\text{Co}_{0.25}\text{LiMn}_{0.37}\text{Ni}_{0.37}\text{O}_2$)
(**layered** $\text{Li}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$ **cathode**
materials for **lithium-ion** batteries)
- IT 182442-95-1, Cobalt lithium manganese nickel oxide
(**layered** $\text{Li}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$ **cathode**
materials for **lithium-ion** batteries)
- IT 1310-65-2, Lithium hydroxide 10141-05-6, Cobalt nitrate
10377-66-9, Manganese nitrate 13138-45-9, Nickel nitrate
(use for prepn. of **layered** $\text{Li}[\text{Ni}_x\text{Co}_{1-2x}\text{Mn}_x]\text{O}_2$)

cathode materials for lithium-ion batteries)

- L24 ANSWER 19 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
 2001:506353 Document No. 135:244855 Novel **lithium-ion cathode** materials based on **layered** manganese oxides. Ammundsen, Brett; Paulsen, Jens (Pacific Lithium (New Zealand) Limited, Auckland, N. Z.). Advanced Materials (Weinheim, Germany), 13(12-13), 943-956 (English) 2001. CODEN: ADVMEW. ISSN: 0935-9648. Publisher: Wiley-VCH Verlag GmbH.
- AB A review with 69 refs. Lithium manganese oxides with a two-dimensional layered crystal structure are of high fundamental and technol. interest as cathode materials for rechargeable lithium-ion batteries, due to the safety, low cost, and low toxicity of manganese-based materials. However, basic problems such as the collapse of the layer structure during cycling of the battery have proven difficult to solve. This collapse usually leads to poor rate performance and to evolution of steps in the voltage profile, both of which are undesirable for practical applications. This article highlights important recent work on stabilization of the layered crystal structure of lithium manganese oxide. In particular we focus on the use of layered manganese oxide as a base for developing novel complex solid-soln. cathode materials with **improved capacity**, cycling stability, and safety.
- CC **52-0** (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 59, 72
- ST **lithium battery cathode**
layered manganese oxide review; crystal structure manganese oxide cathode safety review
- IT **Battery cathodes**
 Safety
 (lithium-ion **cathode** materials based on **layered** manganese oxides)
- IT Secondary **batteries**
 (lithium; lithium-ion **cathode** materials based on **layered** manganese oxides)
- IT 12057-17-9, **Lithium** manganese oxide LiMn_2O_4
 (lithium-ion **cathode** materials based on **layered** manganese oxides)
- L24 ANSWER 20 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
 2001:83085 Document No. 134:149992 Preparation of layered LiCoO_2 by microwave-polymer network process and its electrochemistry performance investigation. Yang, S. T.; Zhang, Y. F.; Jia, J. H.; Lu, Q. Z.; Zhang, M. C.; Di, L. (College of Chemistry and Environmental Science, Henan Normal University, Henan Xinxiang, 453002, Peop. Rep. China). Solid State Ionics: Materials and Devices, [Proceedings of the Asian Conference], 7th, Fuzhou, China,

Oct. 29-Nov. 4, 2000, 311-314. Editor(s): Chowdari, B. V. R.; Wang, Wenji. World Scientific Publishing Co. Pte. Ltd.: Singapore, Singapore. (English) 2000. CODEN: 69AWLC.

- AB Layered LiCoO₂ was prepd. by microwave-polymer network process. X-ray diffraction and SEM tests showed that the samples prepd. by microwave-polymer network process had fine crystallinity, and the electrochem. measurements showed **improved capacity** and cyclic ability of the samples. The chronoamperometric and cyclic voltammetry tests indicated that Li⁺ diffused easily in LiCoO₂ prepd. by the microwave-polymer network process.
- CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
- ST cobalt lithium oxide layered prepn microwave polymer network process; **cathode layered cobalt lithium oxide battery**

L24 ANSWER 21 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2001:64322 Document No. 134:103336 **Lithium** thin film
lamination technology on electrode to increase battery capacity. Hisashi, Tsukamoto; Chananit, Sintuu (Quallion, LLC, USA). PCT Int. Appl. WO 2001006578 A2 20010125, 14 pp. DESIGNATED STATES: W: AE, AL, AU, BA, BB, BG, BR, CA, CN, CR, CU, CZ, DM, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LS, LT, LV, MA, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, TR, TT, UA, US, UZ, VN, YU, ZA, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US19348 20000714. PRIORITY: US 1999-PV144146 19990716.

- AB Lithium is laminated onto or into an electrode structure comprising a metal conducting layer with an active material mixt. of, for example, a nanocomposite of silicon monoxide, together with graphite and a binder, such as polyvinyl di-fluoride (PVDF). The **lamination of lithium metal onto or into the electrode structure** will reduce the amt. of irreversible capacity by readily supplying a sufficient amt. of lithium ions to form the initial solid electrolyte interface. In order to **laminate lithium onto or into the neg. electrode**, the **lithium is first deposited** onto a carrier, which is then used to **laminate the lithium onto or into the electrode structure**. The next step is placing the coated **electrode material** and the **lithium-deposited plastic** between two rollers or two plates. The rollers or plates are heated to about 120.degree. or within the range of 25-250.degree.. A pressure of 50-600 kg/cm² is applied to the rollers. The speed of movement of the materials through the roller pair or the plate pair is in the range of 10 cm/min to 5 m/min. The method can be used for either single-sided

or double-sided coating. Using this technol. alone, the battery capacity can increase by 7% to 15%.

- IC ICM H01M
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST battery electrode lithium thin film lamination
- IT Lamination
(lithium thin film lamination technol. on electrode to increase battery capacity)
- IT Polyesters, uses
Polyimides, uses
(lithium thin film lamination technol. on electrode to increase battery capacity)
- IT Secondary batteries
(lithium; lithium thin film lamination technol. on electrode to increase battery capacity)
- IT Fluoropolymers, uses
(nanocomposite; lithium thin film lamination technol. on electrode to increase battery capacity)
- IT 7439-93-2, Lithium, uses
(lithium thin film lamination technol. on electrode to increase battery capacity)
- IT 7440-50-8, Copper, uses
(lithium thin film lamination technol. on electrode to increase battery capacity)
- IT 25038-59-9, Polyethylene terephthalate, uses
(lithium thin film lamination technol. on electrode to increase battery capacity)
- IT 113443-18-8, Silicon monoxide
(nanocomposite; lithium thin film lamination technol. on electrode to increase battery capacity)
- IT 24937-79-9, PvdF
(nanocomposite; lithium thin film lamination technol. on electrode to increase battery capacity)
- IT 9003-07-0, Polypropylene
(sheet; lithium thin film lamination technol. on electrode to increase battery capacity)

- L24 ANSWER 22 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2001:46259 Document No. 134:118337 Solid **laminated** batteries
using oxide ceramics. Hara, Toru; Kitahara, Nobuyuki; Kamimura,
Toshihiko; Mishima, Hiromitsu; Magome, Shinji; Osaki, Makoto;
Higuchi, Hisashi (Kyocera Corp., Japan). Jpn. Kokai Tokkyo Koho JP
2001015152 A2 20010119, 5 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1999-184432 19990629.
- AB The batteries comprise stacks of cathodes, solid electrolytes, and
anodes, all of them comprising oxide ceramics, bonded together in
series and/or in parallel with elec. insulating polymer adhesives
and/or elec. conductive polymer adhesives. The oxide ceramic
electrolytes and electrodes prevent deterioration of the
characteristics of batteries (e.g., secondary Li batteries), and the
voltage and **capacity** of the batteries can be set to
arbitrary values by **lamination** of the battery components
with the polymer adhesives.
- IC ICM H01M010-36
ICS H01M004-02; H01M004-62; H01M006-18
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)
Section cross-reference(s): 38, 57
- ST **laminated** battery electrode electrolyte oxide ceramic;
lithium battery solid electrolyte oxide ceramic
- IT Carbon black, uses
(elec. conductive filler dopant; solid batteries using electrodes
and electrolytes of oxide ceramics **laminated** with elec.
insulating and/or conducting polymer adhesives)
- IT Secondary batteries
(**lithium**; solid batteries using **electrodes**
and electrolytes of oxide ceramics **laminated** with elec.
insulating and/or conducting polymer adhesives)
- IT Adhesives
Battery anodes
Battery cathodes
Battery electrolytes
Ceramics
Electric conductors
Electric insulators
(solid batteries using electrodes and electrolytes of oxide
ceramics **laminated** with elec. insulating and/or
conducting polymer adhesives)
- IT Acrylic polymers, uses
Epoxy resins, uses
Oxides (inorganic), uses
Phenolic resins, uses
Polyamides, uses
Polyesters, uses
Polyimides, uses

Polysiloxanes, uses

(solid batteries using electrodes and electrolytes of oxide ceramics **laminated** with elec. insulating and/or conducting polymer adhesives)

IT 1312-43-2, Indium oxide 1314-13-2, Zinc oxide, uses 1327-33-9, Antimony oxide 1332-29-2, Tin oxide 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-44-0, Carbon, uses 7440-50-8, Copper, uses 7440-57-5, Gold, uses 7782-42-5, Graphite, uses 12673-69-7, Potassium titanate

(elec. conductive filler; solid batteries using electrodes and electrolytes of oxide ceramics **laminated** with elec. insulating and/or conducting polymer adhesives)

IT 1313-13-9, Manganese dioxide, uses 1313-96-8, Niobium oxide 1314-35-8, Tungsten oxide, uses 11099-11-9, Vanadium oxide 11126-15-1, **Lithium** vanadium oxide 13463-67-7, Titanium oxide, uses 39300-70-4, **Lithium** nickel oxide 39302-37-9, **Lithium** titanium oxide 39457-42-6, **Lithium** manganese oxide 52627-24-4, Cobalt **lithium** oxide 111418-37-2, Germanium lithium vanadium oxide (Ge_{0.6}Li_{3.6}V_{0.4}O₄) 120479-61-0, Aluminum lithium titanium phosphate (Al_{0.3}Li_{1.3}Ti_{1.7}(PO₄)₃) 123921-35-7, Lithium titanium oxide (Li_{1.33}Ti_{1.67}O₄) 131344-56-4, Cobalt **lithium** nickel oxide 155472-68-7, Lithium manganese oxide (Li_{1.1}Mn_{1.9}O₄) 290347-96-5, Lithium iodide metaphosphate oxide (Li₅₆I₁₅(PO₃)₂₉₀₆) 320591-13-7, Lithium niobium borate oxide (Li_{1.05}Nb_{0.25}(BO₃)_{0.700.1})

(solid batteries using **electrodes** and electrolytes of oxide ceramics **laminated** with elec. insulating and/or conducting polymer adhesives)

L24 ANSWER 23 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

2001:10777 Document No. 134:74031 Lithium ion polymer secondary battery and gelatinous polymer electrolyte for sheet battery. Watari, Yusuke; Minakuchi, Akio; Kobayashi, Tadashi; Higami, Akihiro; Takeuchi, Sawako (Mitsubishi Materials Corp., Japan). Eur. Pat. Appl. EP 1065743 A2 20010103, 27 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2000-107740 20000411. PRIORITY: JP 1999-185569 19990630; JP 1999-192665 19990707; JP 1999-201061 19990715.

AB A **lithium** ion polymer secondary **battery** is a **laminate** of a pos.-electrode sheet of a pos.-electrode collector foil provided with an active material thereon, a neg.-electrode sheet of a neg.-electrode collector foil provided with another active material thereon, and a polymer electrolyte layer interposed between the pos.-electrode sheet and the neg.-electrode sheet. One of the pos.-electrode sheet and the neg.-electrode sheet is a strip and is fan-folded at least one time so that the pos.-electrode sheet is provided on the surface of the

active material on the sheet. The other one of the pos.-electrode sheet and the neg.-electrode sheet consists of a plurality of sheet segments having an area which is the same as the area of each flat portion of the fan-folded sheet. The sheet segments are interposed between the flat portions of the fan-folded sheet so that the polymer electrolyte layer is in contact with the surfaces of the active materials. The battery exhibits a large discharge

capacity and **improved** discharge **capacity** characteristics after a no. of discharge-charge cycles and does not cause internal short-circuiting.

IC ICM H01M010-40

ICS H01M010-04

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

L24 ANSWER 24 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2000:769641 Document No. 133:352629 Nonaqueous electrolyte batteries.
Iwata, Mikio; Inoue, Takefumi (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2000306607 A2 20001102, 7 pp.
(Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-111021 19990419.

AB The batteries have **capacity** .gtoreq.100 A.h and use
separators having thickness .gtoreq.50 .mu.m. The batteries are
preferably secondary Li batteries, contg. .gtoreq.50 cathodes and
.gtoreq.50 anodes stacked with separators; and the separators
contain .gtoreq.2 different porous membranes, e.g., polyethylene and
polypropylene membranes, having thickness .gtoreq.40 .mu.m.

IC ICM H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)

ST secondary **lithium battery** polypropylene
polyethylene **lamine** separator

IT Secondary batteries

(lithium; structure of large **capacity** secondary lithium
batteries)

IT Secondary battery separators

(separators from **laminated** porous polyethylene and
polypropylene membranes for secondary lithium batteries)

IT 9002-88-4, Polyethylene 9003-07-0, Polypropylene
(separators from **laminated** porous polyethylene and
polypropylene membranes for secondary lithium batteries)

L24 ANSWER 25 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2000:686821 Document No. 133:284088 Construction of large-scale
lithium secondary batteries. Majima, Masatoshi; Ujiie, Satoshi;
Yagasaki, Eriko (Sumitomo Electric Industries, Ltd., Japan; Kansai
Electric Power Co.). Jpn. Kokai Tokkyo Koho JP 2000268873 A2
20000929, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
1999-66916 19990312.

AB **Laminated** Li secondary is heat-sealed in a bag-type container capable of preventing the permeation of H₂O and org. solvent. The material for the bag-type container is manufd. by hot **lamination** of a polyolefin film (for the inner wall) with an Al foil 10-100 .mu.m thick through an adhesive film. The bag-type containers are suitable for **laminated Li** secondary **batteries** having a **capacity** of 50-1000 Ah for increased gravimetric power d.

IC ICM H01M010-40

ICS H01M002-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium large **capacity** battery construction

IT Polyolefins

(**laminate** with aluminum foil; construction of large-scale lithium secondary batteries with increased gravimetric power d.)

IT 7429-90-5, Aluminum, uses

(polyolefin film **laminated** with foil of; construction of large-scale lithium secondary batteries with increased gravimetric power d.)

L24 ANSWER 26 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2000:291414 Document No. 132:296140 Nonaqueous electrolyte batteries. Hatsuta, Kazuhito; Hatazawa, Tsuyonobu; Hara, Tomitaro (Sony Corporation, Japan). PCT Int. Appl. WO 2000025373 A1 20000504, 23 pp. DESIGNATED STATES: W: CN, JP, KR, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE. (Japanese). CODEN: PIXXD2. APPLICATION: WO 1999-JP5799 19991020. PRIORITY: JP 1998-303085 19981023.

AB The batteries use a **laminated** packaging material for battery cases, where the innermost layer of the **laminate** is a melt bonding resin layer having (T.times.S.times.R/W.times.C) .ltoreq.0.96 .mu.g/W.h.day (T = thickness of resin layer in .mu.m, R = water permeability of the layer in g/m².day, S = cross-sectional area of the hot seal part of the resin, W = av. width of the hot seal part in cm, and C = **capacity** of the battery in W.h. The batteries are preferably secondary Li batteries.

IC ICM H01M002-02

ICS H01M002-08; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST secondary lithium battery case **laminated**

packaging material; melt bonding resin battery case **laminate**

IT Secondary **batteries**

(**lithium**; characteristics of melt bonding resin **layers** in **laminated** packaging materials for secondary lithium batteries)

- IT 9002-88-4, Polyethylene
(characteristics of melt bonding resin layers in
laminated packaging materials for secondary
lithium batteries)
- L24 ANSWER 27 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
2000:21359 Document No. 132:95705 Charge/discharge performance of
electron beam deposited tin oxide thin film negative electrodes.
Nam, Sang Cheol; Yoon, Young Soo; Cho, Won I.; Cho, Byung Won; Yun,
Kyung Suk; Chun, Hai Soo (Battery and Fuel Cell Research Center,
Korea Institute of Science and Technology, Seoul, 136-650, S.
Korea). Electrochemistry (Tokyo), 68(1), 32-37 (Japanese) 2000.
CODEN: EECTFA. ISSN: 1344-3542. Publisher: Electrochemical Society
of Japan.
- AB Electron beam deposited tin oxide thin films were studied for use as
an anode for lithium rechargeable batteries. Tin oxide thin films
prepd. under different heat treatment conditions (temp. and time)
were investigated by the implementation of x-ray diffraction anal.,
Auger electron spectroscopy, and at. force microscopy.
Charge/discharge performance of these thin films, typically
exhibiting capacities >300 mA-h/g lasting >100 cycles, depends on
the heat treatment temp., which influences the structure, grain
sizes, and adhesion to the substrate. Capacity was decreased as
film thickness **increased**, but **capacity** loss was
very small in accordance with increase of charge/discharge rate.
Using a.c. impedance anal., it was found that capacity loss was
caused by resistance increase at cut off voltage under 0.1 V.
Lithiated SnO2/polyaniline/V2O5 type full cell showed the capacity
of 200 mA-h/g, with active voltage of 2.0-2.7 V.
- CC **52-2** (Electrochemical, Radiational, and Thermal Energy
Technology)
- IT Battery anodes
(charge/discharge performance of electron beam **deposited**
tin oxide thin-film **anodes** for **lithium**
batteries)
- IT 1332-29-2, Tin oxide 18282-10-5, Tin dioxide
(charge/discharge performance of electron beam **deposited**
tin oxide thin-film **anodes** for **lithium**
batteries)
- L24 ANSWER 28 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1999:753469 Document No. 131:353691 Secondary nonaqueous electrolyte
batteries and battery control method. Yata, Shizukuni; Kikuta,
Haruo; Kinoshita, Hajime; Tajiri, Hiroyuki; Kato, Shiro (Osaka Gas
Company Limited, Japan). PCT Int. Appl. WO 9960652 A1
19991125, 89 pp. DESIGNATED STATES: W: AE, AL, AU, BA, BB,
BG, BR, CA, CN, CU, CZ, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP,
KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, RU, SG, SI,

SK, SL, TR, TT, UA, US, UZ, VN, YU, ZA, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (Japanese). CODEN: PIXXD2. APPLICATION: WO 1999-JP2658 19990520. PRIORITY: JP 1998-138347 19980520; JP 1998-165373 19980612; JP 1998-369928 19981225; JP 1998-369936 19981225; JP 1998-369969 19981225; JP 1998-369986 19981225; JP 1998-373667 19981228; JP 1999-65072 19990311.

AB The batteries contain cathodes, anodes, and Li salt electrolytes; have **capacity** .gtoreq.30 W.h, energy d. .gtoreq.180 W.h/L, and thickness .ltoreq.12 mm. Preferably, the cathodes contain Mn oxide and the anode active mass has a graphite core with d002 .ltoreq.0.34 nm and an amorphous C surface layer with d002 .gtoreq.0.34 nm. The batteries are tested for charge-discharge characteristics at several spots and the operation of the batteries are controlled by the testing results.

IC ICM H01M010-40
ICS H01M004-02; H01M004-58; H01M002-16
; H01M010-42

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Polyolefin fibers
(ethylene; separators from nonwoven fabrics and nonwoven fabric-porous membrane **laminates** for secondary **lithium batteries**)

IT Secondary battery separators
(separators from nonwoven fabrics and nonwoven fabric-porous membrane **laminates** for secondary **lithium batteries**)

IT Polypropene fibers, uses
(separators from nonwoven fabrics and nonwoven fabric-porous membrane **laminates** for secondary **lithium batteries**)

IT 9002-88-4, Polyethylene
(separators from nonwoven fabrics and nonwoven fabric-porous membrane **laminates** for secondary **lithium batteries**)

L24 ANSWER 29 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1999:610764 Document No. 131:230977 Active materials for nonaqueous electrolyte secondary batteries, their manufacture, and lithium secondary batteries. Amin, Karil (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 11260362 A2 19990924 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1998-80392 19980312.

AB The active materials comprise Sn oxide **laminated** under orientation. Surfactant mols. may be present in between the **laminated** Sn oxide layers. The **laminated**

materials are prepd. in liq. phase. Secondary **lithium batteries** comprising f **laminated** Sn oxide contg.

$\text{Li}_x\text{Sn}_y\text{BzO}_q$ ($x > 0$; $y > 0$; $z > 0$; $q > 0$; B = surfactant) in between the layers, as anode active materials are also claimed. Batteries with high **capacity** are obtained.

IC ICM H01M004-48

ICS H01M004-02; H01M004-58; H01M004-60
; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 46

IT Secondary **batteries**

(**lithium**, nonaq.; nonaq. secondary **lithium batteries** with **layer**-structured tin oxide anodes contg. surfactant mols. in between tin oxide layers)

IT **Battery anodes**

Surfactants

(nonaq. secondary **lithium batteries** with **layer**-structured tin oxide anodes contg. surfactant mols. in between tin oxide layers)

IT Intercalation compounds

(tin oxide; nonaq. secondary **lithium batteries** with **layer**-structured tin oxide anodes contg. surfactant mols. in between tin oxide layers)

IT 7646-78-8, Tin tetrachloride, processes

(liq.-phase prepn. of tin oxide from; nonaq. secondary **lithium batteries** with **layer**-structured tin oxide anodes contg. surfactant mols. in between tin oxide layers)

IT 1332-29-2P, Tin oxide

(nonaq. secondary **lithium batteries** with **layer**-structured tin oxide anodes contg. surfactant mols. in between tin oxide layers)

IT 577-11-7

(surfactant; nonaq. secondary **lithium batteries** with **layer**-structured tin oxide anodes contg. surfactant mols. in between tin oxide layers)

IT 7439-93-2, Lithium, uses

(tin oxide interlayers contg.; nonaq. secondary **lithium batteries** with **layer**-structured tin oxide anodes contg. surfactant mols. in between tin oxide layers)

L24 ANSWER 30 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1999:490368 Document No. 131:132273 Anode for lithium ion secondary battery and its manufacture. Ikeda, Konosuke; Uotani, Hiroshi; Nakamura, Taiichi; Okuda, Jiro; Ishimaru, Atsuo; Murakami, Toru; Tanabe, Katsuhisa; Saijo, Yoshiji (Uemura Kogyo K. K., Japan). Jpn. Kokai Tokkyo Koho JP 11214010 A2 19990806 Heisei, 4 pp. (Japanese).

CODEN: JKXXAF. APPLICATION: JP 1998-25093 19980122.

- AB This anode comprises an **anode** supporting body and a **Li+-retaining material deposited** on the supporting body: and the Li+-retaining material is coated with a metal. The anode is manufd. by coating the Li+-retaining material with a metal and then **depositing** the resultant Li+-retaining material on the **electrode** supporting body. The obtained anode has a desirable cond., sufficient capacity and is useful for heightening the use coeff.
- IC ICM H01M004-62
ICS H01M004-02; H01M004-04; H01M010-40
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- IT Battery anodes
(anodes comprising lithium ion-retaining material coated with metal for **improved** cond. and **capacity** for lithium secondary battery)
- IT Coating process
(electroless, metal coating formation by; anodes comprising lithium ion-retaining material coated with metal for **improved** cond. and **capacity** for lithium secondary battery)
- IT Secondary batteries
(lithium; anodes comprising lithium ion-retaining material coated with metal for **improved** cond. and **capacity** for lithium secondary battery)
- IT 7440-02-0, Nickel, processes 7440-50-8, Copper, processes
(coating with; anodes comprising lithium ion-retaining material coated with metal for **improved** cond. and **capacity** for lithium secondary battery)
- IT 7782-42-5, Graphite, uses
(lithium ion retaining material, copper coating on; anodes comprising lithium ion-retaining material coated with metal for **improved** cond. and **capacity** for lithium secondary battery)
- L24 ANSWER 31 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1999:465104 Document No. 131:324944 The study of irreversible capacity in lithium-ion anodes prepared with thermally oxidized graphite. Rubino, Robert S.; Takeuchi, Esther Sans (Wilson Greatbatch Ltd., Clarence, NY, USA). Journal of Power Sources, 81-82, 373-377 (English) 1999. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science S.A..
- AB The effect of thermal oxidn. on the anodic characteristics of graphite was investigated. This treatment led to a large **increase** in irreversible **capacity** which was attributed to the expansion of pores in the graphite. Variations in the electrolyte were found to significantly affect the magnitude of this increase. A comparison of various electrolytes was used to

study the irreversible redn. reactions which take place at the anode during the first cycle of a lithium-ion cell.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium ion battery irreversible capacity; graphite passivation layer lithium battery anode

L24 ANSWER 32 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1999:460209 Document No. 131:159687 The **Layered**

Intercalation Compounds $\text{Li}(\text{Mn}_{1-y}\text{Co}_y)\text{O}_2$: Positive

Electrode Materials for Lithium-Ion Batteries. Armstrong, A. Robert; Robertson, Alastair D.; Gitzendanner, Robert; Bruce, Peter G. (School of Chemistry, University of St. Andrews, St. Andrews, Fife, KY16 9ST, UK). Journal of Solid State Chemistry, 145(2), 549-556 (English) 1999. CODEN: JSSCBI. ISSN: 0022-4596. Publisher: Academic Press.

AB The layered intercalation compds. $\text{Li}(\text{Mn}_{1-y}\text{Co}_y)\text{O}_2$; 0.1 to eq. y. 0.5 cannot be prepd. by conventional solid state reaction but have been synthesized using a soln.-based route coupled with ion exchange. A continuous range of solid solns. with rhombohedral symmetry exists for 0.1 to eq. y. 0.5. Consideration of transition metal to oxygen bond lengths indicates that Mn^{3+} is replaced by cobalt in the trivalent state. Localized high spin Mn^{3+} ($3d^4$) induces a cooperative Jahn-Teller distortion in layered LiMnO_2 , lowering the symmetry from rhombohedral $R\bar{3}m$ to monoclinic ($C2/m$). Substitution of as little as 10% Mn by Co is sufficient to suppress the distortion in $\text{Li}_{0.9}(\text{Mn}_{0.9}\text{Co}_{0.1})\text{O}_2$, whereas half the Li must be extd. from LiMnO_2 to achieve a single undistorted rhombohedral phase. On removing and reinserting Li in LiMnO_2 only half the quantity of Li (equiv. to a specific charge of 130 mAhg⁻¹) may be reinserted on the first cycle; this substantial drop in capacity is eliminated with only 10% Co substitution. The latter material can sustain a large capacity on cycling (200 mAhg⁻¹). Higher Co contents have somewhat lower capacities but fade less at higher cycle nos. The marked **improvement** in **capacity** retention of the Co-doped materials compared with pure LiMnO_2 may be related in part to the absence of the Jahn-Teller distortion. Electrochem. data indicate conversion to a spinel-like structure on cycling. Such conversion is progressively slower with increasing Co content. Cycling of this spinel-like material is significantly better than Co-doped spinel of the same compn. These materials are of interest as electrodes in rechargeable lithium batteries. (c) 1999 Academic Press.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 72

IT Battery cathodes

Jahn-Teller effect

(**layered** intercalation compds. as **cathode** materials for **lithium-ion** batteries)

IT Secondary **batteries**

(**lithium**; **layered** intercalation compds. as **cathode** materials for **lithium-ion** batteries)

IT 207990-15-6, Cobalt lithium manganese oxide $\text{Co}_{0.2}\text{Li}_{0.8}\text{Mn}_{0.8}\text{O}_2$
236750-94-0, Cobalt lithium manganese oxide ($\text{Co}_{0.1}\text{Li}_{0.9}\text{Mn}_{0.9}\text{O}_2$)

(**layered** intercalation compds. as **cathode** materials for **lithium-ion** batteries)

IT 214536-41-1, Cobalt lithium manganese oxide
(**layered** intercalation compds. as **cathode** materials for **lithium-ion** batteries)

L24 ANSWER 33 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1999:415800 Document No. 131:104446 Surface modified graphites for secondary lithium-ion batteries. Wei, Jie; Lee, Jim Yang; Liu, Zhaolin; Yu, Aishui (Department of Chemical Engineering, National University of Singapore, Singapore, 119260, Singapore). Proceedings - Electrochemical Society, 98-16(Lithium Batteries), 51-63 (English) 1999. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.

AB Synthetic graphite (SFG44) was chem. modified by Cu and CuO **depositions** and used as the **anodes** in rechargeable **lithium-ion** batteries. The CuO modification has resulted in substantial **improvements** in discharge **capacity**, cyclability and the redn. of irreversible capacity loss in the first few cycles of use. This is attributed to facilitated SEI formation as enabled by a preceding reaction involving the redn. of CuO in the presence of Li^+ . In comparison the enhancement by Cu deposition comes primarily from the cond. of Cu in lowering the ohmic polarization in redox reactions.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72

L24 ANSWER 34 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1999:137226 Document No. 130:198842 High-**capacity** sealed secondary nonaqueous-electrolyte battery. Kondo, Koichi; Yasunami, Shoichiro; Tanaka, Mitsutoshi (Fuji Film Celltec K. K., Japan; Fuji Photo Film Co., Ltd.). Jpn. Kokai Tokkyo Koho JP 11054147 A2 19990226 Heisei, 14 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1997-207906 19970801.

AB In the title battery assembled by **laminating** or coiling a **Li-contg.** mixed oxide-based **cathode** sheet, a **Li-intercalatable** anode sheet, and a separator, inserting the electrodes into a battery can, injecting a **Li salt-contg.** nonaq. electrolyte, and sealing, void vol. inside the battery after the sealing is 2-30% of that before the injection of the electrolyte.

The battery has high storage stability and shows good cycling performance.

IC ICM H01M010-40

ICS H01M002-34; H01M004-02; H01M004-58

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 35 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
 1999:81656 Document No. 130:127456 Lithium-ion battery. Moses, Peter R.; Zeng, Shuming; Wang, Enoch; Wei, Guang (Duracell Inc., USA). PCT Int. Appl. WO 9904448 A1 19990128, 32 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1998-US14538 19980714. PRIORITY: US 1997-897775 19970721.

AB A Li-ion battery has a <30- or <20-.mu.m deposit of a Group 1 element such as Li between the cathode and the anode. The Group 1 element deposit can be on a surface of an electrode separator. The Group 1 element can **increase** the charging **capacity** of the battery, eliminate the irreversible **capacity** of the battery, **improve** the battery cycle life, or increase the charging reversibility of the battery.

IC ICM H01M010-40

ICS H01M002-16

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium ion battery separator **deposit**

IT **Battery anodes**

Battery cathodes

Secondary **battery** separators

(**lithium deposit** on **lithium-ion**)

L24 ANSWER 36 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
 1998:714638 Document No. 130:40859 The use of hybrid-power sources for improved performance with pulsed loads. Roth, E. Peter; Nagasubramanian, G. (Sandia National Laboratories, Albuquerque, NM, 87185-061, USA). Proceedings of the Power Sources Conference, 38th, 512-515 (English) 1998. CODEN: PPOCFD. Publisher: National Technical Information Service.

AB Elec. characteristics of hybrid power sources consisting of Li-ion cells and double layer capacitors were studied at 25.degree. and -20.degree.. The cells were initially evaluated for pulse performance and then measured in hybrid modes of operation. Cells manufd. by Panasonic delivered pulses up to 3 A and cells from A&T

delivered 4 A at 25.degree. before cell capacity dropped. Measured cell resistances were 0.15 .OMEGA. and 0.12 .OMEGA., resp. These measurements were repeated at -20.degree.. Direct coupling of the cells and capacitors ("dumb hybrid") extended the pulse limits to 5.6 A using the Panasonic cells and 9 A for the A&T cells. Operation in a "smart hybrid" mode using uncoupled cell/capacitor discharge allowed full cell capacity usage at 25.degree. and showed a factor of 5 **improvement** in delivered **capacity** at -20.degree..

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **lithium battery** double **layer** capacitor power

L24 ANSWER 37 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1998:587744 Document No. 129:177890 Properties of silver-

deposited graphite anodes for lithium

secondary **batteries**. Honbo, Hidetoshi; Takeuchi, Seiji; Momose, Hideto; Nishimura, Katsunori; Horiba, Tatsuo; Muranaka, Yasushi; Kozono, Yuzo (Hitachi Research Laboratory, Hitachi, Ltd., Ibaraki-ken, Hitachi-shi, Omika-cho, 319-1292, Japan). *Denki Kagaku oyobi Kogyo Butsuri Kagaku*, 66(9), 939-944 (Japanese) 1998. CODEN: DKOKAZ. ISSN: 0366-9297. Publisher: Denki Kagaku Kyokai.

AB Silver-deposited graphite anodes have been developed using a wet chem. redn. method for depositing silver particles with the diam. about 100 nm onto graphite particles. There was the increase of discharge capacities for silver-deposited graphite anodes with the silver content smaller than 10 wt%, comparing to that for the graphite anode. The max. capacity was obtained at the silver content of 5 wt%. This **increase** of discharge **capacity** may originate from the obsd. decrease of elec. resistance in electrode materials. Ag deposition improved high rate discharge performance and cyclability. There was only the capacity loss of 12% for Ag deposited anodes after 1500 charge and discharge operations. Long cyclability of Ag deposited anodes is presumed to be assocd. with a stable solid electrolyte interface during charge and discharge cycles.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **lithium battery** silver **deposited** graphite **anode**

IT Secondary **batteries**

(**lithium**; properties of silver-**deposited** graphite **anodes** for lithium secondary **batteries**)

IT Battery anodes

(properties of silver-**deposited** graphite **anodes** for lithium secondary **batteries**)

- IT 7439-93-2, Lithium, uses 7782-42-5, Graphite, uses
(properties of silver-**deposited** graphite **anodes**
for **lithium** secondary **batteries**)
- L24 ANSWER 38 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1998:512721 Document No. 129:164004 Lithium secondary batteries.
Okuta, Satoko; Yamashita, Masaya (Asahi Chemical Industry Co., Ltd.,
Japan). Jpn. Kokai Tokkyo Koho JP 10214640 A2 **19980811**
Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
1997-16925 19970130.
- AB In batteries comprising **laminates** of cathodes, separators,
and anodes; elec. insulating layer that adsorbs free acid is placed
in between the cathode active material and the separator. Decrease
of **capacity** due to repeated charge-discharge cycles and
storage is prevented.
- IC ICM **H01M010-40**
ICS **H01M002-16; H01M004-02; H01M004-58**
- CC **52-2** (Electrochemical, Radiational, and Thermal Energy
Technology)
- ST **lithium battery** free acid adsorption
layer; secondary battery free acid adsorption layer
- IT Acids, processes
(free; **lithium** secondary **batteries** having
free acid-adsorption **layers** in between cathodes and
separators)
- IT Adsorption
(**lithium** secondary **batteries** having free
acid-adsorption **layers** in between cathodes and
separators)
- IT Secondary batteries
(**lithium**; **lithium** secondary **batteries**
having free acid-adsorption **layers** in between cathodes
and separators)
- IT 7782-42-5, Graphite, uses
(anode; **lithium** secondary **batteries** having
free acid-adsorption **layers** in between cathodes and
separators)
- IT 12057-17-9, Lithium manganese oxide (LiMn_2O_4)
(cathode; **lithium** secondary **batteries** having
free acid-adsorption **layers** in between cathodes and
separators)
- IT 21324-40-3, Lithium hexafluorophosphate
(electrolyte, acid generation from; **lithium** secondary
batteries having free acid-adsorption **layers** in
between cathodes and separators)
- IT 1304-28-5, Barium oxide, uses 1305-78-8, Calcia, uses 1309-48-4,
Magnesia, uses 1344-28-1, Alumina, uses
(free acid-adsorption **layer**; **lithium**

- secondary **batteries** having free acid-adsorption layers in between cathodes and separators)
- IT 7664-39-3, Hydrofluoric acid, processes (lithium secondary **batteries** having free acid-adsorption layers in between cathodes and separators)
- L24 ANSWER 39 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1998:350634 Document No. 129:83743 Reduction of the irreversible capacity in hard-carbon anode materials prepared from sucrose for Li-ion batteries. Buiel, Edward; Dahn, J. R. (Department of Physics, Dalhousie University, Halifax, NS, B3H 3J5, Can.). Journal of the Electrochemical Society, 145(6), 1977-1981 (English) 1998. CODEN: JESOAN. ISSN: 0013-4651. Publisher: Electrochemical Society.
- AB Chem. vapor deposition (CVD) of a carbonaceous substance from ethylene gas at temps. >700.degree. on hard carbon anode materials causes a dramatic redn. in irreversible capacity from >150 to <70 mAh/g. The reversible capacity (approx. 540 mAh/g) and the voltage profile were not changed, suggesting that the hydrogen content and lithium insertion mechanisms are not significantly affected in the new materials. The authors believe that the ethylene treatment modifies the surface and reduces the samples' ability to adsorb/chemisorb/react with species from air which have previously been correlated to an **increase** in irreversible capacity. This treatment can be performed either during or after pyrolysis, with similar results, and three processes that control the amt. of carbonaceous material deposited are outlined in this paper. Wide-angle x-ray scattering measurements confirm the growth of a soft-carbon phase resulting from the CVD process, presumably on the surface. The redn. in irreversible capacity occurs without significant changes in the underlying structure of the hard carbon as measured by small-angle X-ray scattering, XPS, and nitrogen adsorption Brunauer-Emmett-Teller surface area measurements.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72
- IT 74-85-1, Ethylene, reactions
(anode materials for Li-ion **batteries** prepd. from sucrose with carbon deposited from)
- L24 ANSWER 40 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1997:762142 Document No. 128:63976 Lithium secondary **batteries** using carbon laminate anodes. Kurihara, Masato; Maruyama, Satoshi; Oe, Kazuhide (TDK Electronics Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 09306494 A2 19971128 Heisei, 6 pp. (Japanese). CODEN: JKXXAF.

APPLICATION: JP 1996-146584 19960516.

- AB In the title batteries, anodes contain C **laminates** having C lattice spacing d002 0.350-0.400 nm, H/C at. ratio .gtoreq.0.10, and sp. surface area .gtoreq.200 m²/g. The C **laminates** are prepd. by intercalating C sources into saponite or montmorillonite, heat treatment for polymg. the C sources, and carbonization at 500-1200.degree.. Thus, saponite intercalated with furfuryl alc. was heated at 150.degree. for polymg. furfuryl alc., and heat treated at 500.degree. for carbonization to give black powders which are then treated with HF and HCl for dissoln. and removal of the clay mineral. The obtained C **lamine**te showed 0.78 H/C at. ratio, 0.351 nm d002, 260 m²/g BET, and 1150 mAh/g discharge **capacity**, when used as an anode in a battery contg. LiCl.
- IC ICM **H01M004-58**
ICS **H01M010-40**
- CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
- ST **lithium battery anode** carbon
laminete; clay mineral intercalation battery anode; polymer
guest carbonization clay mineral anode
- IT Polymers, preparation
(guest; in prepn. of C **laminates** by polymn. and
carbonization of C sources in clay mineral interlayers for Li
secondary battery anodes)
- IT Clay minerals
(host; in prepn. of C **laminates** by polymn. and
carbonization of C sources in clay mineral interlayers for Li
secondary battery anodes)
- IT Carbonaceous materials (technological products)
(**laminates**; prepn. of C **laminates** by polymn.
and carbonization of C sources in clay mineral interlayers for Li
secondary battery anodes)
- IT Battery anodes
Carbonization
Graphitization
Intercalation
Polymerization
(prepn. of C **laminates** by polymn. and carbonization of
C sources in clay mineral interlayers for Li secondary battery
anodes)
- IT 25212-86-6P, Furfuryl alcohol homopolymer
(guest; in prepn. of C **laminates** by polymn. and
carbonization of C sources in clay mineral interlayers for Li
secondary battery anodes)
- IT 1318-93-0, Montmorillonite, uses 1319-41-1, Saponite
(host; in prepn. of C **laminates** by polymn. and

carbonization of C sources in clay mineral interlayers for Li secondary battery anodes)

- L24 ANSWER 41 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1997:385403 Document No. 127:20866 Organic electrolyte **lithium batteries** with **laminated anode** stacks.
Hashimoto, Take; Ando, Nobuo; Yamaguchi, Masaki; Kinoshita, Hajimi; Hado, Yukinori; Yada, Shizukuni (Kanebo, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 09102328 A2 19970415 Heisei, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1995-286732 19951005.
- AB The batteries use anode stacks contg. several anodes and anode collectors having through holes and porosity .gtoreq.10%. Preferably the anodes have a non-sol. infusible substrate of a heat treated product of an arom. condensation polymer, having a polyacene structure and a H/C at. ratio 0.05-0.5. The battery has a total Li content of .gtoreq.500 mA.h/g anode active mass with .gtoreq.100 mA.h/g of the Li being from the anode active mass. These batteries have high **capacity** and voltage.
- IC ICM H01M010-40
ICS H01M004-02; H01M004-70
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST **lithium battery laminated anode stack**
- IT Battery anodes
(**laminated** stacks of anodes contg. pyrolyzed phenolic resin on expanded copper collectors for secondary lithium batteries)
- IT Phenolic resins, uses
(pyrolyzed; **laminated** stacks of anodes contg. pyrolyzed phenolic resin on expanded copper collectors for secondary lithium batteries)
- IT 7440-50-8, Copper, uses
(**laminated** stacks of anodes contg. pyrolyzed phenolic resin on expanded copper collectors for secondary lithium batteries)
- L24 ANSWER 42 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1997:346949 Document No. 127:21028 Polymer solid electrolytes for lithium secondary batteries. Higashimoto, Koji; Sasaoka, Michio; Nakanaga, Takefumi; Inubushi, Akiyoshi (Shin-Kobe Electric Machinery Co., Ltd., Japan; Otsuka Chemical Co., Ltd.). Jpn. Kokai Tokkyo Koho JP 09092281 A2 19970404 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1995-242788 19950921.
- AB One or all parts of surfaces of carbon anodes for Li batteries are coated with polymers having arom. and/or heteroarom. hydrocarbonyl, which are one parts of title solid electrolytes. The electrolytes **improve** Li-absorbing property, **capacity**, and cycle

life for the batteries.

IC ICM H01M004-58

ICS H01M004-62; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

IT Secondary **batteries**

(**lithium**; polymer solid electrolytes for
laminated Li secondary batteries)

IT Polyphosphazenes

(methoxyoligoethylene, styryl-terminated; polymer solid
electrolytes for **laminated Li secondary**
batteries)

IT Battery electrolytes

(polymer solid electrolytes for **laminated Li**
secondary batteries)

IT 7782-42-5, Graphite, uses

(anodes, powders; polymer solid electrolytes for
laminated Li secondary batteries)

IT 12190-79-3, Cobalt **lithium** oxide (CoLiO₂)

(**cathodes**; polymer solid electrolytes for
laminated Li secondary batteries)

L24 ANSWER 43 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1996:721378 Document No. 125:334222 Manufacture of anodes coated with
fluoride or chloride **layers** and their use in secondary
lithium batteries. Katsumata, Tomoo (Toshiba
Battery, Japan). Jpn. Kokai Tokkyo Koho JP 08250108 A2 19960927
Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
1995-51084 19950310.

AB The anodes are manufd. by forming LiF or LiCl on Li or Li-Al alloy
foils in an Ar or N gas atm. contg. small amt. of HF or HCl. The
batteries consist of cathodes, anodes using Li or Li-Al alloy anode
active masses, and Li+-conductive electrolytes, and the active
masses are coated with thin or 100-1000 nm-thickness layer of LiF or
LiCl. The batteries have **improved capacity** and
deterioration resistance in storage.

IC ICM H01M004-04

ICS H01M004-02; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 56

L24 ANSWER 44 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1996:350295 Document No. 125:15244 Rectangular lithium ion secondary
batteries of large size for maintenance-free applications.
Hirosachi, Nobuyoshi; Kobayashi, Jukichi; Kaneko, Isao; Inoe,
Minoru; Koyama, Tomiichi (Mitsubishi Chemical Corp., Japan). Jpn.
Kokai Tokkyo Koho JP 08096842 A2 19960412 Heisei, 9 pp.
(Japanese). CODEN: JKXXAF. APPLICATION: JP 1994-228346 19940922.

AB In a **Li ion secondary battery** consisting of cells with electrodes **laminated** via separators, the electrode tabs are elec. connected to resp. conductors to form collectors. The cooled electrolyte may be passed to the surface of a conductor which is elec. and thermally connected to the electrode leads. Operation of a circulation pump supplying the cooled electrolyte is controlled by the temp. inside the battery. The invention is suitable for Li ion batteries having a high **capacity** and a high energy d. which are designed for elec. vehicles, load leveling, etc.

IC ICM H01M010-38

ICS H01M010-40; H01M010-52

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 45 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1996:350291 Document No. 125:15240 Rectangular lithium ion secondary batteries of large size and improved cooling system for maintenance-free applications. Hirosachi, Nobuyoshi; Kobayashi, Jukichi; Kaneko, Isao; Inoe, Minoru; Koyama, Tomiichi (Mitsubishi Chemical Corp., Japan). Jpn. Kokai Tokkyo Koho JP 08096838 A2 19960412 Heisei, 8 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1994-227080 19940921.

AB In a **Li ion secondary battery** consisting of cells with electrodes **laminated** via separators, the electrode tabs are elec. and thermally connected to resp. conductors to form collectors. The tabs are combined sep. for anodes and cathodes and the end portions of tabs are welded to the collectors. The resulting metal surface is sepd. from an electrolyte and a cooling medium is passed to the metal surface to withdraw heat accumulated inside the battery and prevent temp. increase inside the battery. The invention is suitable for Li ion batteries having a high **capacity** and a high energy d. which are designed for elec. vehicles, load leveling, etc.

IC ICM H01M010-38

ICS H01M002-26; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 46 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1996:167964 Document No. 124:207226 Anodes for secondary lithium batteries and batteries using them. Soejima, Hiroshi; Takada, Yoshinori (Mitsubishi Cable Industries, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 07326342 A2 19951212 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1994-116299 19940530.

AB The **anodes** comprise **Li** alloys-contg. porous **layers laminated** on C layers as active mass layers. The Li alloys may be Li-Si and Li-Zn alloys. The batteries

using these anodes have high emf. and **capacity**, and long cycle life. Thus, Cu films were coated with graphite particles using org. solvents and plasma sprayed with Li_{3.5}Si alloys to give porous films for the anodes.

IC ICM H01M004-02

ICS H01M004-40; H01M004-66; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Anodes

(battery, from lithium alloys-contg. porous layers and carbon layers)

IT 7440-44-0, Carbon, uses 7782-42-5, Graphite, uses (battery anodes from lithium

alloys-contg. porous layers and layers of)

IT 12201-29-5, Lithium silicide (Li₇Si₂) 174643-48-2 (battery anodes from porous layers contg.)

L24 ANSWER 47 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1996:143282 Document No. 124:181075 Cobalt dissolution in LiCoO₂-based non-aqueous rechargeable batteries. Amatucci, G. G.; Tarascon, J. M.; Klein, L. C. (Bellcore, NVC 3Z-281, 331 Newman Springs Road, Red Bank, NJ, 07701, USA). Solid State Ionics, 83(1,2), 167-73 (English) 1996. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier.

AB Rechargeable lithium batteries using a variety of differently prepd. LiCoO₂ samples were cycled to 4.5 V vs. Li and the neg. **electrode** was investigated for Co **deposits** after the cell was cycled over 25 times. Qual. anal. revealed evidence of cobalt dissoln. for samples showing high capacity loss with cycle no. A direct correlation between the percentage capacity loss and percentage cobalt loss was established. Cycling LiCoO₂-based cells to voltages ranging from 4.1 to 4.5 was found to result in an **increase** in the **capacity** fade for voltages greater than 4.2 V, consistent with the traditional limit of reversibility of 4.2 V for LiCoO₂. For voltages greater than 4.2 V, the capacity fading scaled with the measured amt. of cobalt dissoln. which was found to correlate with structural changes obsd. by in-situ x-ray diffraction.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 48 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1995:240134 Document No. 122:13774 Secondary nonaqueous batteries with **improved** anodes for high **capacity** and long cycle life. Tanjo, Takeji (Nissan Motor, Japan). Jpn. Kokai Tokkyo Koho JP 06243860 A2 19940902 Heisei, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-29306 19930218.

AB The **batteries** use **Li** or **Li** alloy **anodes** have a **layer** of the same material for the battery cathodes formed on either or both sides.

IC ICM H01M004-02

ICS H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 49 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1995:207854 Document No. 122:13760 Button-type secondary lithium batteries and their manufacture. Yoshimitsu, Kazumi; Kajita, Kozo; Manabe, Toshikatsu (Hitachi Maxell, Japan). Jpn. Kokai Tokkyo Koho JP 06231755 A2 19940819 Heisei, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-164327 19930608.

AB The **batteries** use **anodes** comprising a **Li layer laminated** with an **Al layer**. The anode may be a **laminate** of a **Li-Al** alloy and an **Al layer** with the alloy layer on the separator side. The **batteries** are prepd. by **laminating** the **Li** and **Al layers** and alloying the 2. The batteries have suppressed short circuit and high **capacity**.

IC ICM H01M004-02

ICS H01M004-04; H01M004-40; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 50 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1994:89174 Document No. 120:89174 Influence of surface conditions on the electrode characteristics of carbon electrodes for lithium batteries. Takamura, Tsutomu; Kikuchi, Masahiro; Ebana, Jun; Nagashima, Masamichi; Ikezawa, Yasunari (Coll. Sci., Rikkyo Univ., Toshimaku, 171, Japan). Proceedings - Electrochemical Society, 93-23(Proceedings of the Symposium on New Sealed Rechargeable Batteries and Supercapacitors, 1993), 228-37 (English) 1993. CODEN: PESODO. ISSN: 0161-6374.

AB Importance of surface condition for obtaining better active materials of lithium batteries has been pointed out with examples of the surface treatment of pitch based carbon fiber, and the deposition of polypyrrole (PPy) on the active carbon fibers (ACF). Electrochem. intercalation of lithium into the pitch based carbon fibers prepd. at various temps. were examd. in propylene carbonate(PC)/ethylene carbonate(EC) contg. 1M LiClO4 at room temp. The capacity was larger for the sample obtained at 1000.degree., which, however, showed lowering of the capacity during the cycling. The sample obtained at 2200.degree. gave relatively lower capacities but it was rather stable during the cycling. The 1000.degree. sample, when heated at 700.degree. in the inert atm., exhibited an **increased capacity** and at the same time, the cyclability was also improved. The improvement is attributed to the

removal of the surface-OH groups whose removal during the heating was ascertained by FTIR. The 2200.degree. sample as obtained gave no strong signals of -OH. PPy was examd. as a cathode material. When it was deposited electrochem. on ACF, the cathode capacity/g of PPy was found increased by about ten times as compared to that of PPy deposited on the nickel net (50mesh).

CC 72-2 (Electrochemistry)

Section cross-reference(s): 52

IT 30604-81-0, Polypyrrole

(cathode, deposited on carbon fibers, for lithium battery)

IT 7440-02-0, Nickel, uses

(polypyrrole deposited on, for cathode for lithium battery)

L24 ANSWER 51 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1994:58603 Document No. 120:58603 Anodes for secondary lithium batteries and the batteries. Nakagawa, Yoshiteru; Mabuchi, Akihiro (Osaka Gas Co Ltd, Japan). Jpn. Kokai Tokkyo Koho JP 05283063 A2 19931029 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1992-76668 19920331.

AB The anodes are laminated carbon fiber-carbon film composites. Batteries using these anodes have high capacity and long cycle life.

IC ICM H01M004-02

ICS H01M004-58; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Carbon fibers, uses

(lithium-intercalating anodes from laminates of carbon films and, for secondary batteries)

IT Anodes

(battery, lithium, carbon fiber-carbon film laminates for)

IT 7440-44-0

(carbon fibers, lithium-intercalating anodes from laminates of carbon films and, for secondary batteries)

IT 7440-44-0, Carbon, uses

(film, lithium-intercalating anodes from laminates of carbon fibers and, for secondary batteries)

L24 ANSWER 52 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1994:58602 Document No. 120:58602 Anodes for lithium secondary batteries and the batteries. Nakagawa, Yoshiteru; Mabuchi, Akihiro (Osaka Gas Co Ltd, Japan). Jpn. Kokai Tokkyo Koho JP 05283062 A2 19931029 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1992-76666 19920331.

- AB The anodes are laminates of C particles and C films. Batteries using these anodes have **improved capacity** and long cycle life.
- IC ICM H01M004-02
ICS H01M004-58; H01M010-40
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST **anode carbon laminate lithium battery**
- IT **Anodes**
(**battery, lithium, carbon particle-carbon film laminates** for)
- IT Pitch
(coal-tar, **lithium anodes** contg. **laminates** of carbon particles and, for secondary batteries)
- IT Coke
(needle, **lithium anodes** contg. **laminates** of carbon films and, for secondary batteries)
- IT 7440-44-0, Carbon, uses
(particles and films, **lithium anodes** contg. **laminated**, for secondary **batteries**)
- L24 ANSWER 53 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1993:542907 Document No. 119:142907 Reversible potassium vanadium bronze cathodes (KxV6O13+y) with various potassium to vanadium ratios. Andrukaitis, E. (Air Res. Dev. Branch, Dir. Res. Dev., Ottawa, ON, K1A 0K2, Can.). Journal of Power Sources, 44(1-3), 603-10 (English) 1993. CODEN: JPSODZ. ISSN: 0378-7753.
- AB Electrodes of cryst. KxV6O13+y, where 0.0 .ltoreq. x .ltoreq. 3.7 and 0.1 .ltoreq. y .ltoreq. 3.1, were prepd. by thermal decompn. of electrochem.-deposited (NH4)xK4-xV6O16 phases at 300-350.degree.. The reversible Li insertion into the materials was measured under cyclic voltammetry and const. current conditions. Phase changes during discharge resembled those of V2O5 or V6O13 for similar V oxidn. state and small K/V ratios (.ltoreq.0.3). The reversible capacity decreased as the K/V ratios increased from 0.1 to 0.5, and was small above K/V = 0.5 (Li/V < 0.1). The reversible **capacity** of the bronzes **improved** for lower O/V ratios; however best cycle life was obtained for nonstoichiometric V oxides with K/V ratios 0.05-0.3 for O/V ratios 2.0-2.5. Thus, >50 cycles at the C-rate were obtained with 5-10% of the capacity lost at 0.4 electrons/V depth-of-discharge.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72
- IT 11126-20-8P, Potassium vanadium oxide
(cathodes, prepn. of, by thermal decompn. of electrochem.-**deposited ammonium potassium vanadates**, for

lithium batteries)

- L24 ANSWER 54 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1993:521214 Document No. 119:121214 Thermal stability of lithium
anodes in an amorphous vanadium oxide (V2O5)/lithium battery system.
Arakawa, Masayasu; Nemoto, Yasue; Tobishima, Shinichi; Ichimura,
Masahiro; Yamaki, Junichi (Interdisciplinary Res. Lab., NTT, Tokai,
319-11, Japan). Journal of Power Sources, 44(1-3), 517-22 (English)
1993. CODEN: JPSODZ. ISSN: 0378-7753.
- AB The thermal stability of amorphous V2O5/Li batteries was
investigated. V compds. dissolved from the cathode during
charge/discharge cycles and were **deposited** on the
Li anode. The amt. of deposited V
increased with the accumulation **capacity**; no V
compds. were deposited in fresh batteries. Low reactivity of the V-
deposited Li anode was obsd. by
calorimetry. Chem.-state anal. and morphol. investigation of the Li
anode suggest that the improvement in stability is primarily due to
the passivation film.
- IT 7439-93-2, Lithium, uses
(**anodes**, vanadium **deposition** on, during
charge/discharge cycles, battery thermal stability in relation
to)
- RN 7439-93-2 HCAPLUS
CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)
- Li
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)
- ST lithium vanadium oxide battery thermal stability; vanadium
deposition lithium anode stability
- IT 7439-93-2, Lithium, uses
(**anodes**, vanadium **deposition** on, during
charge/discharge cycles, battery thermal stability in relation
to)
- IT 7440-62-2, Vanadium, miscellaneous
(**deposition** of, on **lithium anodes**,
during charge/discharge cycles, **battery** thermal
stability in relation to)
- L24 ANSWER 55 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1993:416972 Document No. 119:16972 Composite layered electrode based
on polyacetylene. Tkachenko, L. I.; Zueva, A. F.; Saratovskikh, S.
L.; Roshchupkina, O. S.; Efimov, O. N. (Inst. Khim. Fiz.,
Chernogolovka, Russia). Elektrokimiya, 28(12), 1818-25 (Russian)

1992. CODEN: ELKKAX. ISSN: 0424-8570.

- AB A good cyclable composite layered electrode was obtained by the chem. polymn. of acetylene on an Al foil (grade An-4) by using modified polymn. catalysts contg., as a reducing agent, polyisobutylalumoxane with a mol. wt. of 900. During cycling of the obtained composite layered electrode in the potential range of 0-2 V (vs. a Li ref. electrode) in solns. of LiClO₄ and LiBF₄ in propylene carbonate, the polyacetylene film fulfills the role of an ion-conducting membrane (solid electrolyte) for Li⁺ ions with the formation of the .beta.-phase Li_xAl alloy on an Al support, which allows one to significantly **increase** the electrode **capacity**. Some 25 charge-discharge cycles were conducted without significant loss of Coulombic efficiency and exfoliation of the polyacetylene film from the substrate.
- CC 72-2 (Electrochemistry)
Section cross-reference(s): 35, 36, 52, 73
- IT 7791-03-9, **Lithium** perchlorate 14283-07-9,
Lithium tetrafluoroborate
(composite **layered electrode** cycling at range
of potentials in propylene carbonate solns. of)

L24 ANSWER 56 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1992:238836 Document No. 116:238836 Conducting polymers and electric
conductors therefrom. Ono, Shigetoshi; Kubota, Tadahiko (Fuji Photo
Film Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 03273023 A2
19911204 Heisei, 19 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1990-71177 19900320.

- AB The polymers comprise 2 types of repeating ethylenic units, with 1
type having side chains of elec.-conducting aniline and/or
heterocyclic compd. repeating units, and the other having side
chains of cyclic carbonate ester, cyclic ester, or cyclic ether
units. The polymers may also have repeating ethylenic units having
anionic side chains. The elec. conductors are the polymers
laminated with polymer electrolytes or separators.
Secondary **Li batteries** using these
laminates have high **capacity** and long cycle life.

IC ICM C08G061-12
ICS B32B007-02; B32B007-06; B32B027-30; C08F299-00; C08G073-00;
H01M010-40

- CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)
Section cross-reference(s): 38

L24 ANSWER 57 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1991:636290 Document No. 115:236290 Manufacture of **laminated**
lithium/manganese dioxide batteries. Hanabusa,
Soichi; Teraoka, Hirohito (Toshiba Battery Co., Ltd., Japan). Jpn.
Kokai Tokkyo Koho JP 03084855 A2 **19910410** Heisei, 4 pp.

- (Japanese). CODEN: JKXXAF. APPLICATION: JP 1989-218594 19890828.
- AB In the manuf. of the batteries, the cathode is prepd. by applying a cathode-active mixt. paste on a substrate sheet, drying the paste at 100-200.degree. (surface temp.) to form cracks on the center part of the surface, and pressing to form notches at the center part. Batteries prepd. by this method had no electrolyte leaking during sealing and had suppressed **capacity** dispersion.
- IC ICM H01M004-08
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST lithium manganese dioxide laminated battery
- IT Batteries, primary
(lithium/manganese dioxide, manuf. of laminated
, prevention of electrolyte leaking and **capacity**
dispersion in)
- L24 ANSWER 58 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1991:46603 Document No. 114:46603 Cathodes for nonaqueous batteries. Yamamoto, Kohei; Hino, Yoshihisa; Harada, Yoshiro; Nakanishi, Masanori; Nagura, Hideaki (Fuji Electrochemical Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 02234350 A2 19900917 Heisei, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1989-53650 19890308.
- AB The cathodes of .lambda.-MnO2 (a form of MnO2 prepd. from LiMn2O4), a conductive agent, and a binder are coated on their surface, in contact with collector, by another cathode compn. of .gtoreq.1 MnO2 of other than the .lambda.-form (e.g. .gamma.- and .beta.-form) and an oxide or sulfide of transition metals, a conducting agent, and a binder. With this approach the high capacity of .lambda.-MnO2 at a convenient voltage can be used, and a stable discharge voltage during discharge, with **increased capacity** is maintained. Thus, a 0.2-mm-thick disk of a mixt. of MoO3 8, graphite 1, and PTFE 1 part was pressed with a 0.5-mm-thick disk of .lambda.-MnO2 8, graphite 1, and PTFE 1 part to obtain a 2-layered cathode. A Li battery was constructed, using the **cathode** (the 1st layer in contact with collector) and 1M LiClO4/propylene carbonate-DME electrolyte. This battery showed initially 3.0 V and smooth discharge curve, unlike a ref. battery with .lambda.-MnO2 cathode that showed initially 4.0 V and a stepwise discharge curve.
- IC ICM H01M004-06
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- L24 ANSWER 59 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1990:518426 Document No. 113:118426 Anodes containing graphite and their manufacture for secondary batteries. Suzuki, Tomonari; Wada, Hiroshi; Yoshimoto, Yoshikazu (Sharp Corp., Japan). Jpn. Kokai Tokkyo Koho JP 02007360 A2 19900111 Heisei, 6 pp.

(Japanese). CODEN: JKXXAF. APPLICATION: JP 1988-158344 19880627.
AB The anodes are plates or cylindrical bodies of alternate sections of elec. conductive layers and graphitic C layers expanding in the thickness direction of the plates or bodies. The anodes are prepd. by vapor-phase depositing elec. conductive films with graphitic C, **laminating** the films, heat treating the **laminates**, and cutting the **laminates** in their stacking direction; or by vapor-phase depositing wedge-shaped elec. conductors with graphitic C, assembling the wedges into cylindrical bodies, and heat treating. A Li-Cr3O8 battery using a Li-insertable Ni-graphitic C anode had a **capacity** of 250 mA-h/g C when cycled between 2.0-3.5 V.

IT 7439-93-2, **Lithium**, uses and miscellaneous
(**anodes**, graphitic carbon-nickel **laminates**
for, in batteries)

RN 7439-93-2 HCAPLUS

CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IC ICM H01M004-02

ICS H01M004-04

CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)

IT **Anodes**

(**battery**, **lithium**-insertable graphitic
carbon-nickel **laminates** for, manuf. of)

IT 7440-02-0, **Nickel**, uses and miscellaneous
(**anodes** from **laminates** of graphitic carbon and,
lithium-insertable, for **batteries**)

IT 7440-44-0, **Carbon**, uses and miscellaneous
(**anodes** from **laminates** of nickel and graphitic,
lithium-insertable, for **batteries**)

IT 7439-93-2, **Lithium**, uses and miscellaneous
(**anodes**, graphitic carbon-nickel **laminates**
for, in batteries)

L24 ANSWER 60 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1989:518218 Document No. 111:118218 Secondary lithium batteries.
Watanabe, Atsushi; Muramatsu, Hiromochi (Nippondenso Co., Ltd.,
Japan). Jpn. Kokai Tokkyo Koho JP 01134875 A2 19890526 Heisei, 7
pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1987-292742
19871119.

AB **Li batteries** have **anodes** comprising a
Li metal layer attached to the Al (alloy) sheet
with the Al layer facing the sheet-type cathodes of the batteries

and a separator between the electrodes. Batteries using these anodes have **increased capacity**, higher voltage and active-mass utilization, suppressed dendrite formation, and long cycle life.

IT 7439-93-2, **Lithium**, uses and miscellaneous
(**anodes** with backside **layer** of, for secondary
batteries)

RN 7439-93-2 HCAPLUS

CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IC ICM H01M010-40

ICS H01M004-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT 12798-95-7

(**anode**, for secondary **batteries**, with
lithium layer on backside)

IT 7439-93-2, **Lithium**, uses and miscellaneous
(**anodes** with backside **layer** of, for secondary
batteries)

L24 ANSWER 61 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1989:234685 Document No. 110:234685 Secondary nonaqueous batteries.
Eda, Nobuo; Koshina, Hide; Morita, Teruyoshi; Nishikawa, Yukio;
Matsui, Toru (Matsushita Electric Industrial Co., Ltd., Japan).
Jpn. Kokai Tokkyo Koho JP 01048383 A2 19890222 Heisei, 4
pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1987-204690
19870818.

AB The title batteries have Li-alloy or C anodes and cathodes contg. a
main active mass of .apprx.3-V potential and auxiliary mass Nb2O5,
where the discharge **capacity** of the anode is larger than
that of the main cathode-active mass but smaller than total
capacities of cathodes. This structure prevents disruption of the
cryst. structure of the main cathode- active mass and enables
efficient recharging after exhaustive discharging. Thus, a battery
using a cathode consisting of 7 parts MnO2 obtained by baking a
1:0.1 (mol) MnO2-CrO3 mixt. and 3 parts Nb2O5, a **laminated**
Li/Cd-In-Pb anode, and a LiClO4/propylene
carbonate-MeOCH2CH2OMe electrolyte was charged to 3.4 V and
discharged to .ltoreq.0.1 V. The battery was able to recharge to
3.4 V after a 40-day standing in the discharged state, and had a
capacity recovery of 95%, vs. 40% for a battery without
Nb2O5.

IC ICM H01M010-40

ICS H01M004-40; H01M004-48; H01M004-58

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 62 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1989:26702 Document No. 110:26702 Secondary nonaqueous lithium
batteries. Morita, Teruyoshi; Eda, Nobuo; Koshina, Hide; Nishikawa,
Yukio; Matsui, Tooru (Matsushita Electric Industrial Co., Ltd.,
Japan). Jpn. Kokai Tokkyo Koho JP 63228573 A2 19880922 Showa, 6 pp.
(Japanese). CODEN: JKXXAF. APPLICATION: JP 1987-61578 19870317.

AB The title batteries have MoO₃-contg. MnO₂ **cathodes** and
Li anodes laminated with Pb-Cd (or
Pb-In-Cd) alloy sheets with the effective capacity of the anode
falls between those of MnO₂ and of MnO₂ + MoO₃ in the cathodes.
Thus, a cathode contg. 20.0 mA-h MnO₂ and 4 mA-h MoO₃ was used in a
battery having an anode of a 29.5 mA-h Li sheet laminated with a
20:5:75 Cd-In-Pb alloy sheet. The battery was cathode-limiting at
the beginning and became anode-limiting after repeated charging and
discharging due to the inseretion of part of the Li into the cathode
and became inactive. After discharged to 0V, stood for 1 mo., and
subjected to charge-discharge cycles, this battery was able to cycle
for 6 times, vs. 3 times for a battery using a 25.0-mA-h MnO₂
cathode and a 40.0-mA-h anode.

IC ICM H01M010-40

ICS H01M004-02; H01M004-40; H01M004-50

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Batteries, secondary

(lithium-alloy/manganese oxide-molybdenum oxide, **capacity**
ratio in, for **improved** overdischarge performance)

L24 ANSWER 63 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN
1986:171479 Document No. 104:171479 Zinc alkaline batteries.
Furukawa, Sanehiro; Inoe, Kenji; Nogami, Mitsuzo (Sanyo Electric
Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 60225372 A2 19851109
Showa, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
1984-80516 19840420.

AB Zn alk. batteries use an electrolyte contg. 0.5-1.0M of a Li compd.
Use of this electrolyte prevents passivation of the anode and
increases the effective discharge **capacity** of the
batteries by preventing deposition of K zincate **layers** on
the **anode** surface by incorporating **Li** zincate in
the **deposit**. Thus, an anode sheet was prepd. from ZnO 80,
Zn powder 10, HgO 5, and a fluoropolymer powder 5% and attached on
both sides of a Cu collector. An air electrode consisted of a grid
collector and a mixt. of Pt-deposited active and a fluoropolymer.
The ZnO-satd. 30% KOH electrolyte contained 0.5M LiOH. The battery
showed a longer cycle life than a control battery using KOH
electrolyte without LiOH.

IC ICM H01M010-26

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 64 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1986:98022 Document No. 104:98022 **Laminated** battery.

Suematsu, Kazusane; Tajima, Yasuhiro; Arakawa, Tatsumi (Asahi Chemical Industry Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 60163374 A2 19850826 Showa, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1984-17144 19840203.

AB A **laminated** battery is obtained by packing in series in a metallic case 2 or 3 unit cells each obtained by wrapping in a plastic film a Li anode sepd. from a fluorinated graphite via an electrolyte-impregnated separator. The battery has a large **capacity** and a flat discharge curve.

IT 7439-93-2, uses and miscellaneous
(**anode, laminated battery**)

RN 7439-93-2 HCAPLUS

CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IC ICM H01M006-42

CC 72-3 (Electrochemistry)

ST fluorinated graphite lithium laminated
battery

IT Plastics, film

(lithium anode wrapped with, for sepn. from fluorinated graphite
in **laminated** battery)

IT Batteries, primary

(**lithium, laminated**)

IT 7439-93-2, uses and miscellaneous
(**anode, laminated battery**)

IT 11113-63-6

(in **lithium laminated battery**)

L24 ANSWER 65 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1985:456832 Document No. 103:56832 **Layered lithium**

battery. (Hitachi, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 60068558 A2 19850419 Showa, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1983-176412 19830926.

AB **Layered Li battery** has a Li

anode, a Li ion-conducting **layered** electrolyte, and a layered $\text{WO}_3\text{-x}$ ($0 < x < 1$) cathode, that may contain a transition metal oxide. W oxide has advantages of being isotropic to diffusion of Li ion and provides high diffusion coeff. and reversibility in regard to Li ion, which results in **increased** discharge **capacity** of the battery.

Thus, a mirror-finished quartz plate was sputtered with WO₃-x (x .ltoreq.0.1) in a 9:1 Ar-H mixt. at 0.03 torr, and cooled in water. The high-frequency output was 2.5 W/cm². A solid-electrolyte layer of 3:2 Li₄SiO₄-Li₃PO₄ mixt. was formed by sputtering, and the **Li anode layer** was vacuum **deposited**. From x-ray examn., the W oxide layer was amorphous, and the diffusion coeff. for Li ion was 2 .times. 10⁻¹⁵ m²/s. The battery short-circuit current was 2.9 mA/cm² and its capacity was 0.15 mA-h/cm² in repeated charge-discharge cycles at 1.5-2.5 V.

IC ICM H01M004-48

ICS H01M006-18

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 66 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1985:175010 Document No. 102:175010 Flat battery. Waki, Eiichi; Kobayashi, Shigeo; Hashimoto, Yutaka; Nakai, Miyoji; Nakai, Toshio (Matsushita Electric Industrial Co., Ltd., Japan). PCT Int. Appl. WO 8500248 A1 19850117, 14 pp. DESIGNATED STATES: W: US; RW: DE, FR, GB. (Japanese). CODEN: PIXXD2. APPLICATION: WO 1983-JP202 19830623.

AB A thin flat battery (e.g., Li battery) having an **increased capacity** per unit area consists of an insulator film (e.g., a laminate of an Al-foil and polyester film) folded in two for hermetically sealing the battery and cathode and anode terminals on 1 side of the folded film.

IC ICM H01M002-26

ICS H01M002-30; H01M006-16

CC 72-3 (Electrochemistry)

ST insulator film sealing battery; aluminum polyester **laminate lithium battery**

L24 ANSWER 67 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1985:81781 Document No. 102:81781 Solid-state lithium battery. (Hitachi, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 59203370 A2 19841117 Showa, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1983-77430 19830504.

AB Li solid-state battery has anode contg. Li as active material, solid electrolyte that **transfers Li** ion, and **cathode** consisting of Fe oxide film mainly composed of Fe₃O₄ with optional additive, obtained by sputtering method. Improved discharge behavior is obtained because of good contact with the solid electrolyte and compactness of the cathode material. Thus, Fe₃O₄ film was formed by sputtering in 9:1 Ar-H atm, on quartz plate, using 99.9% Fe₃O₄ as target. Formed film was homogeneous, compact, and had {111} planes perpendicular to the base. Then solid-electrolyte film composed of Li₄SiO₄ and Li₃PO₄ (3:2 mol ratio) was formed on the cathode, by sputtering. Finally Li anode

film was sputtered to obtain the solid battery. **Increased** discharge **capacity** was obsd.

IC **H01M006-18; H01M004-52**

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L24 ANSWER 68 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1984:414045 Document No. 101:14045 Solid-electrolyte battery. (Hitachi Maxell, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 59009864 A2 19840119 Showa, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1982-118842 19820707.

AB A solid electrolyte battery having **increased** discharge **capacity** consists of a Li or Li alloy anode, an electrolyte selected from Li₃N, Li₃N-LiX mixt. or Li₃N-LiX-LiOH mixt. (X = Br, Cl, I), and a 2 layer cathode with the 1st layer next to the solid electrolyte consisting of iodides selected from Pb, Bi, Hg, Co, Sn, Sb, and Si as well as an elec. conducting agent selected from Ni, Pb, Ag or Cu powder and the 2nd layer consisting of metal sulfides selected from Ti, Pb, Bi, Ni, Ag, Cu, etc.

IC **H01M006-18; H01M004-06**

CC 72-3 (Electrochemistry)

IT 7783-96-2 12262-07-6 12684-19-4 13465-84-4 37349-59-0
51311-89-8 54427-16-6

(cathode contg., two-layer, in solid electrolyte
lithium battery)

IT 1314-87-0 11104-47-5 11113-75-0 11115-78-9 12673-92-6
12751-47-2

(cathode contg., two-layer, in solid-electrolyte
lithium battery)

L24 ANSWER 69 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1984:54582 Document No. 100:54582 High-voltage and energy density battery. (Matsushita Electric Industrial Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 58165248 A2 **19830930** Showa, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1982-49539 19820326.

AB The title battery comprises a light-metal anode, a nonaq. electrolyte, and a CrO₂.51-2.65 cathode. Thus, a cathode was prepd. by press-laminating an expanded Ti grid with 1 g 100:20:30 (by wt.) CrO₂.63-artificial graphite-powd. fluoropolymer mix at 5 tons/cm². A battery using the cathode, an **anode** prepd. by press-laminating a Li plate (2 .times. 2 cm .times. 0.5 mm) with a Ni mesh, and M LiClO₄ in 1:1 (by wt.) dioxane-propylene electrolyte had a discharge **capacity** of .apprx.275 mA-h at 0.5 mA/cm² and cutoff voltage of 2.0 V, and a terminal voltage of .apprx.3.2 V after 30 h discharge at 0.5 mA/cm² vs. .apprx.251 mA-h and .apprx.2.8 V, resp., for a similar battery using CrO₂.48 instead of CrO₂.63.

IC **H01M004-48**

CC 52-2 (Electrochemical, Radiational, and Thermal Energy

Technology)

L24 ANSWER 70 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1983:19516 Document No. 98:19516 Nonaqueous battery with liquid depolarizer and corrodible cathode. Dey, Arabinda Narayan; Bowden, William Lee; Bro, Per (Duracell International, Inc., USA). Fr. Demande FR 2499773 A1 **19820813**, 7 pp. (French). CODEN: FRXXBL. APPLICATION: FR 1982-1982 19820208. PRIORITY: US 1981-232778 19810209.

AB **Laminated** cathodes that corrode during discharge of batteries contg. nonaq. electrolytes do not affect the discharge characteristics of batteries. Thus, a D-size battery cell was constructed by using a spiral **Li** anode, a spiral **cathode** of 8 cold-laminated thin steel sheets, glass-fiber separators, and 1.8M LiAlCl₄ in SOCl₂ soln. The cell provided sustained c.d. of 1.0 mA/cm² and a **capacity** of 12.2 mA-h/cm² at 3.0 V.

IC **H01M006-14**

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

IT 12597-69-2, uses and miscellaneous
(cathode current collector from **laminated** sheets of, **lithium-thionyl chloride battery**)

L24 ANSWER 71 OF 71 HCAPLUS COPYRIGHT 2004 ACS on STN

1978:64099 Document No. 88:64099 Iron disulfide electrodes. Dunning, John S.; Bradley, Thompson G. (General Motors Corp., USA). U.S. US 4053978 **19771018**, 5 pp. (English). CODEN: USXXAM. APPLICATION: US 1976-746822 19761202.

AB FeS₂ electrodes are prepd. by: slurrying FeS₂ in molten S, spreading the slurry into FeS₂-S sheets, solidifying the FeS₂-S sheets, sandwiching the FeS₂-S sheets between porous current-conductor sheets, and heating the formed sandwich to volatilize away S. Flexible FeS₂-S sheets are obtained by heating the slurry to .apprx.300.degree. and then quenching them in H₂O. Thus, a **Li-Al alloy/LiCl-KCl/FeS₂ battery** was prepd. having a planarly **laminated** electrode made in accordance with the invention. The battery was cycled at .apprx.450.degree. for >700 cycles with current efficiencies of >95% and 20% at the beginning and end, resp. It resp. max. sp. **capacity** and peak sp. power were 115 Wh/kg and 90 W/kg.

IC **H01M004-04**

NCL 029623500

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

=> d ti 1-32 138

- L38 ANSWER 1 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Lithium** ion non-aqueous electrolyte **secondary battery** for power supply, has anode and cathode, **laminated** through separator, non-aqueous electrolyte and alkali metal compound and/or alkaline earth metal compound.
- L38 ANSWER 2 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Lamination** apparatus for automated manufacturing of **lithium secondary battery**, has pushing structures linearly movable with pivoting structures to attach positive and negative electrode plates to opposing sides of separator.
- L38 ANSWER 3 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Electrode** for **lithium secondary battery**, includes metallic **foil** on which flour-like copper is formed with copper **layer** coating.
- L38 ANSWER 4 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Anode formation for **primary, secondary electrochemical cell**, involves **depositing** active **layer** comprising **lithium metal (foil)** and multi-**layer** structure of single ion conducting **layers** and polymer **layers** on substrate.
- L38 ANSWER 5 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Lithium** ion **secondary battery** used for portable electronic machine and electric vehicle, comprise anode **sheets** which are **laminated** via collector whose thickness and length satisfies preset relation.
- L38 ANSWER 6 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Non-aqueous-electrolyte **secondary battery** for mobile phones in which a gel-type or plasticizing non-aqueous electrolyte **layer**, a positive electrode and a negative electrode are **laminated**.
- L38 ANSWER 7 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Graphite nanofibers for electron emitting source and **cathode** of **lithium ion secondary battery** comprises graphene **sheets** having truncated conical shape, sequentially arranged through catalytic metal particles.
- L38 ANSWER 8 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Preparation of cathode/separator assembly for electrochemical cells, involves forming protective coating **layer**, and microporous

separator **layer** on temporary substrate, **laminating** cathode to separator, and removing substrate.

- L38 ANSWER 9 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Lithium battery**, useful in personal computer, comprising electrode body and electrode pressurizing means to pressurize electrode body in **lamination** direction of positive and negative electrodes.
- L38 ANSWER 10 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Non-aqueous **secondary battery** for portable telephone, personal computer, has **lithium** containing **metallic foil** on **cathode sheet** through support **layer** and electrolyte containing hydrazine derivative and/or aromatic compound.
- L38 ANSWER 11 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Lithium ion secondary battery** for use in motor vehicles and electrically driven wheel chairs comprises cylindrical electrode **laminate** provided on metal container.
- L38 ANSWER 12 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Electrode** for non-aqueous electrolyte **lithium secondary cell** - has holes in **anode** and **cathode** collectors for attaching **lithium metallic foil** to one surface of mixture **layer**.
- L38 ANSWER 13 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Coating **electrode** on metal **foil** collector for **lithium secondary cell** - involves removing **electrode** mixture adhering on non-coating region of collector by brush.
- L38 ANSWER 14 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Cathode** for **lithium secondary battery** - has carbonaceous powder **layer** formed on surface of **metallic lithium foil**.
- L38 ANSWER 15 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Electrode** plate for **lithium secondary battery** - includes active material **layer** containing **lithium** compound **layer** with **lithium carbonate** and **lithium metal** particle formed on collector containing copper **foil**.
- L38 ANSWER 16 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

- TI Closed type non-aqueous electrolyte **secondary** battery - where the cathode, anode and separator are **laminated** together or wound and inserted in a battery can.
- L38 ANSWER 17 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Cathode for non-aqueous electrolyte **secondary battery** - includes porous metallic **sheet** that is coated with **lithium** ion occlusion material.
- L38 ANSWER 18 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Non-aqueous electrolyte **secondary** battery for electronic device - has **anode** with **laminated lithium** content **metal oxide layer** in which lithium discharge potential of third **layer** is higher than that of active material **layer**.
- L38 ANSWER 19 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Non aqueous **secondary battery** - has **anode sheet** with **layer** of **lithium** containing **metallic oxide**, **cathode sheet** containing composite agent, non-aqueous electrolyte etc..
- L38 ANSWER 20 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Sheet** type **lithium secondary battery** e.g. for cellular phones, personal computers etc. - has separator, impregnated with nonaqueous liquid electrolyte and set between active material **layers** of negative and positive electrode **sheets**.
- L38 ANSWER 21 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Lithium** negative **electrode** manufacturing method e.g. for **secondary battery** used in PC, portable telephone - involves producing **foil-like lithium** in argon atmosphere, which is used as cathode.
- L38 ANSWER 22 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Lithium secondary battery** used in electric vehicle, memory card, medical equipment e.g. pacemaker, hearing aid and various electronic device - has cathode having copper **lamine** with carbon powder that carries minute metal particles that form alloy with **lithium** and **metal** particles that do not form alloy with **lithium** or inter-metallic compounds.
- L38 ANSWER 23 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Non-aqueous **secondary battery** for multitude of applications - has positive and negative electrode **sheets**

of specified chemical composition as described, with separator, including **lithium** salts.

- L38 ANSWER 24 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Non-aqueous **secondary battery** with high discharge capacity - comprises **lithium-containing anode and cathode sheets, lithium salt-containing non-aqueous electrolyte and separator** enclosed in a can; useful for personal computers, mobile phones etc..
- L38 ANSWER 25 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Non-aqueous **secondary battery** for electronic device, video camera, etc. - has agent **layers** in positive electrode **sheet** with differing positive active material.
- L38 ANSWER 26 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Organic electrolyte **secondary battery** with good adhesion between paint **layer** and metal **foil** collector - has cathode painted with film contg. binder and carbon having graded particle size.
- L38 ANSWER 27 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Square type **lithium secondary battery** - in which negative and positive plates consisting of member storable and dischargeable of **lithium metal** are **laminated** through separator and are contained square cast.
- L38 ANSWER 28 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Non-aqueous electrolyte **secondary battery** for camcorder, comprises **metallic lithium foil** stuck on **anode**, from which **lithium** ion gets separated and **deposited** on carbon material during electrochemical reaction.
- L38 ANSWER 29 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Lithium sec. battery cathode alloy** mfr. - by holding **lithium metal** plate between two aluminium metal plates, and immersing **lamine** plate in non-aq. organic solvent NoAbstract.
- L38 ANSWER 30 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Secondary battery** has positive electrode, separator, **metallic foil** and negative **electrodes**, doped with **lithium ion** and **laminated** sequentially and **adhered** to insulated board and enclosed in metallic can.

L38 ANSWER 31 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Non-aqueous solvent **secondary** battery comprises
electricity-generation component comprising integrally
laminated negative plate containing carbonaceous material,
separator and **anode** containing **lithium** complex
oxide.

L38 ANSWER 32 OF 32 JAPIO (C) 2004 JPO on STN
TI **LAMINATED LITHIUM SECONDARY
CELL**

=> d 138 max 1-31

L38 ANSWER 1 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-602804 [57] WPIX
DNN N2003-480381 DNC C2003-164415
TI **Lithium** ion non-aqueous electrolyte **secondary
battery** for power supply, has anode and cathode,
laminated through separator, non-aqueous electrolyte and
alkali metal compound and/or alkaline earth metal compound.
DC L03 W01 X16
PA (SONY) SONY CORP
CYC 1
PI JP 2003208923 A 20030725 (200357)* 9p H01M010-40
ADT JP 2003208923 A JP 2002-249907 20020829
PRAI JP 2001-342871 20011108
IC ICM H01M010-40
ICS H01M004-02; H01M004-58; H01M004-62
AB JP2003208923 A UPAB: 20030906
NOVELTY - The **lithium** ion non-aqueous electrolyte
secondary battery has anode (2) and cathode (1),
laminated through separator (3), and non-aqueous
electrolyte, wound in electrode material. The anode-mix
layer having anode active material (AM) or cathode-mix
layer having cathode AM in anode and cathode, is formed on
both surface of collector. An alkali metal compound and/or alkaline
earth metal compound is contained in the battery.

DETAILED DESCRIPTION - The alkali metal compound and/or an
alkaline earth metal compound are carbonic acid compound and/or a
sulfuric acid compound. The **anode** active material is
lithium-transition metal complex compound. The
transition metal is selected from cobalt, manganese, nickel, iron,
aluminum, vanadium, titanium, copper, zinc, chromium, tin, boron,
magnesium, phosphorous, calcium and gallium.

USE - For power supply for new portable electronic devices such
as camcorder, mobile telephone and laptop computer.

ADVANTAGE - Since the alkali and/or alkaline earth metal is

contained in the battery, the charging and discharging property and expansibility-proof of the battery are improved. The battery has high reliability and high energy density. Swelling of the battery is suppressed, hence the battery package is performed easily, resulting in reduction of capacitance and cost as a battery pack.

DESCRIPTION OF DRAWING(S) - The figure shows the sectional drawing of the **lithium ion non aqueous electrolyte secondary battery**.

anode 1

cathode 2

separator 3

Dwg.1/1

FS CPI EPI

FA AB; GI

MC CPI: L03-E01B5; L03-E01B5C

EPI: W01-C01E5B; X16-B01F; X16-B01F1; X16-E01C; X16-E01E; X16-E09

L38 ANSWER 2 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-048658 [05] WPIX

DNN N2003-038333

TI **Lamination** apparatus for automated manufacturing of **lithium secondary battery**, has pushing structures linearly movable with pivoting structures to attach positive and negative electrode plates to opposing sides of separator.

DC P73 X16

IN HONG, J; HONG, J J

PA (KOKA-N) KOKAM ENG CO LTD

CYC 101

PI EP 1261062 A2 20021127 (200305)* EN 10p H01M010-04

R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
NL PT RO SE SI TR

WO 2002095844 A1 20021128 (200305) EN H01M002-00

RW: EA GH GM KE LS MW MZ OA SD SL SZ TZ UG ZM ZW

W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CO CR CU CZ DE
DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE
KG KP KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ
OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG
US UZ VN YU ZA ZM ZW

KR 2002089717 A 20021130 (200322) H01M002-00

CN 1387276 A 20021225 (200324) H01M010-38

KR 388649 B 20030625 (200405) H01M002-00

ADT EP 1261062 A2 EP 2002-253592 20020522; WO 2002095844 A1 WO
2002-KR933 20020517; KR 2002089717 A KR 2001-28494 20010523; CN
1387276 A CN 2002-120315 20020522; KR 388649 B KR 2001-28494
20010523

FDT KR 388649 B Previous Publ. KR 2002089717

PRAI KR 2001-28494 20010523

IC ICM H01M002-00; H01M010-04; H01M010-38

ICS B32B031-00

AB EP 1261062 A UPAB: 20030121

NOVELTY - A stacking module (110) has several positive and negative plate storing portions (112,114). Positive and negative electrode plate pushing structures adapted to be linearly movable with respect to positive and negative electrode plates pivoting structures (122,124) so as to approach the stacking module and a separator (311) to attach positive and negative electrode plates to opposing sides of the separator.

USE - **Lamination** apparatus for automated manufacturing system for **secondary lithium batteries** including **lithium metal battery**, **lithium ion battery** and **lithium polymer battery** for portable electronic products such as video cameras, portable phones and portable PCs.

ADVANTAGE - Since the positive and negative electrode plates are simultaneously attached to the separator the overall efficiency of the manufacturing operation and productivity of the **secondary batteries** are enhanced.

DESCRIPTION OF DRAWING(S) - The figure shows the schematic perspective view of the **lamination** apparatus.

Stacking module 110

Positive and negative electrode plate storing portions 112,114

Positive and negative electrode plate pivoting structures

122,124

Separator 311

Dwg.1/4

FS EPI GMPI

FA AB; GI

MC EPI: X16-B01F1; X16-F02

L38 ANSWER 3 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-024209 [02] WPIX

CR 2003-179175 [18]

DNN N2003-019233 DNC C2003-006007

TI **Electrode for lithium secondary**

battery, includes metallic foil on which flour-like copper is formed with copper **layer** coating.

DC L03 X16

IN FUJIHARA, T; FUJIMOTO, H; IYORI, M; KAMINO, M; MATSUTA, S; OKAMOTO, T

PA (SAOL) SANYO ELECTRIC CO LTD; (FUJI-I) FUJIHARA T; (FUJI-I) FUJIMOTO H; (IYOR-I) IYORI M; (KAMI-I) KAMINO M; (MATS-I) MATSUTA S; (OKAM-I) OKAMOTO T

CYC 2

PI JP 2002319408 A 20021031 (200302)*

6p H01M004-66

US 2003027050 A1 20030206 (200318)

H01M004-40

ADT JP 2002319408 A JP 2001-124509 20010423; US 2003027050 A1 US
2002-124712 20020418

PRAI JP 2001-124509 20010423; JP 2001-121172 20010419

IC ICM H01M004-40; H01M004-66

ICS H01M004-02; H01M004-38; H01M010-40

AB JP2002319408 A UPAB: 20030317

NOVELTY - The flour-like copper (2) is formed on the surface of a metallic foil (1) by metal plating process. The minute metal-plating copper **layer**, is coated to the flour-like copper.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for **lithium secondary battery**.

USE - For **lithium secondary battery**
(claimed).

ADVANTAGE - Charging and discharging cycle property is improved.

DESCRIPTION OF DRAWING(S) - The figure shows the sectional drawing of the **electrode** for **lithium secondary battery**.

metallic foil 1

flour-like copper 2

Dwg.1/2

FS CPI EPI

FA AB; GI

MC CPI: L03-E01B5

EPI: X16-B01F1; X16-E01; X16-E01C; X16-E02

L38 ANSWER 4 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-291269 [33] WPIX

CR 2001-432627 [46]; 2001-475660 [51]

DNN N2002-227418 DNC C2002-085390

TI Anode formation for **primary, secondary electrochemical cell**, involves depositing active **layer** comprising **lithium metal (foil)** and multi-**layer** structure of single ion conducting **layers** and polymer **layers** on substrate.

DC A85 L03 P42 X16

IN AFFINITO, J; MIKHAYLIK, Y V; SHEEHAN, C J; SKOTHEIM, T A

PA (AFFI-I) AFFINITO J; (MIKH-I) MIKHAYLIK Y V; (SHEE-I) SHEEHAN C J;
(SKOT-I) SKOTHEIM T A; (MOLT-N) MOLTECH CORP

CYC 97

PI US 2002012846 A1 20020131 (200233)* 22p H01M004-40

WO 2002095849 A2 20021128 (200280) EN H01M004-04.

RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW

W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP
KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ

NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US
UZ VN YU ZA ZW

ADT US 2002012846 A1 Provisional US 1999-167171P 19991123, CIP of US
2000-721519 20001121, CIP of US 2000-721578 20001121, US 2001-864890
20010523; WO 2002095849 A2 WO 2002-US16649 20020523
PRAI US 1999-167171P 19991123; US 2000-721519 20001121; US 2000-721578
20001121; US 2001-864890 20010523
IC ICM H01M004-04; H01M004-40
ICS B05D005-12; H01M004-66
AB US2002012846 A UPAB: 20021212

NOVELTY - Anode is formed by **depositing** active
layer (10) comprising **lithium metal** or
lithium metal foil and multi-**layer**
structure (21) comprising 3 or more **layers** selected from
single ion conducting **layers** (40,41) and polymer
layers (30) on substrate. Structure (21) is formed by
depositing polymer or a single ion conducting **layer**
on **layer** (10) followed by **deposition** of another
two **layers** based on preset condition.

DETAILED DESCRIPTION - Anode is formed by **depositing**
active **layer** (10) comprising **lithium**
metal or a **lithium metal** foil and multi-
layer structure (21) comprising three or more **layers**
selected from single ion conducting **layers** (40,41) and
polymer **layers** (30) on a substrate. Structure (21) is
formed by **depositing** a first polymer or a single ion
conducting **layer** on **layer** (10) followed by
deposition of second **layer** comprising a single ion
conducting **layer** if the first **layer** is a
polymer, or a polymer **layer** if the first **layer**
is a single ion conducting **layer**. A third **layer**
comprising a single ion conducting **layer** if the second
layer is a polymer, or a polymer **layer** if the
second **layer** is a single ion conducting **layer** is
deposited subsequently to form the anode.

USE - For primary and secondary electrochemical cell

ADVANTAGE - The electrochemical cell prepared using the anode
favorable cycle characteristics.

DESCRIPTION OF DRAWING(S) - The figure shows a sectional view
of the anode.

Lithium metal layer 10

Multi-layer structure 21

Polymer layer 30

Single ion conducting layer 40,41

Dwg.1/8

TECH US 2002012846 A1UPTX: 20020524

TECHNOLOGY FOCUS - POLYMERS - Preferred Substrate: The substrate is
a metal foil, polymer film, metallized polymer film, electrically

conductive polymer film, polymer film having an electrically conductive coating, electrically conductive polymer film having an electrically conductive metal coating or polymer film dispersed with conductive particles.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Method: After formation of the third **layer**, formation of third **layer** is repeated to form multi-**layer** structure comprising four or more **layers**. A metal alloy **layer** is **deposited** after **depositing** the first polymer or single ion conducting **layer** over the anode active **layer**. A temporary protective metal **layer** is **deposited** on the surface of anode active **layer** and the anode active **layer** is treated with a gaseous material or with carbondioxide plasma to form an intermediate **layer** prior to **depositing** the first polymer or single ion conducting **layer** over the anode active **layer**. Lithium is co-**deposited** in-situ with one or more gaseous materials such as carbon dioxide on the substrate.

Preferred Gaseous Materials: The gaseous material is selected from carbon dioxide, acetylene, nitrogen, ethylene, sulfur dioxide, and/or hydrocarbons, preferably carbondioxide.

Preferred Composition: The metal alloy comprises zinc, magnesium, tin or aluminum. The single ion conducting **layer** of the multi-**layer** structure comprises glass selected from lithium silicates, lithium borates, lithium aluminates, lithium phosphates, lithium phosphorus oxynitrides, lithium silicosulfides, lithium germanosulfides, lithium lanthanum oxides, lithium tantalum oxides, lithium niobium oxides, lithium titanium oxides, lithium borosulfides, lithium aluminosulfides, and/or lithium phosphosulfides. The polymer **layers** comprise a cross-linked polymer formed from the polymerization of one or more acrylate monomers selected from alkyl acrylates, glycol acrylates, and polyglycol acrylates. The **anode** comprises lithium metal co-**deposited** in-situ with one or more gaseous materials and a substrate.

Preferred Arrangement: The metal **layer** is interposed between polymer and single ion conducting **layers**. The intermediate **layer** is interposed between the anode active **layer** and multi-**layer** structure.

Preferred Property: The anode active **layer** has a thickness of 2-100 microns. The multi-**layer** structure has a thickness of 0.5-10 microns, preferably 1-5 microns.

ABEX US 2002012846 A1UPTX: 20020524

EXAMPLE - A vacuum web coating system was loaded with an anode substrate of 23 microns PET metallized on one side with 60 microns of inconel and of 15 cm width. The chamber was evacuated to 10 power -6 Torr. Lithium was deposited on the substrate by heating a thermal

evaporation lithium source to 535 degrees C and then starting the web drive at 0.5 feet per minute. The lithium evaporation was allowed to stabilize to give an 25 microns coating of lithium on the inconel of the substrate layer to form an anode material. A composite cathode was prepared by coating a 3.68 cm wide cathode active layer on a 4.19 cm wide Al/PET substrate. A cathode slurry was prepared from 70 weight parts (wt.pts) of elemental sulfur, 15 wt.pts of Printex XE-2 conductive carbon, 10 wt.pts of graphite, 4 wt.pts of TA22-8 resin and 1 wt.pt of Ionac PFAZ-322. The slurry contained 14 weight% (wt.%) of solids contents in the solvent mixture of 80 wt.% isopropanol, 12 wt.% water, 5 wt.% 1-methoxy-2-propanol and 3 wt.% dimethylethanolamine. The slurry was coated on both sides of the substrate and dried. A dry cathode active layer obtained had a thickness of 20 microns on each side of the current collector with a loading of electroactive cathode material of 1.15 mg/cm². Lithium anode of 10 cm length and 4.19 width were cut from the anode material. Small flat cells were assembled by folding the anode around 4.5 cm length of the composite cathode with a porous E25 SETELA polyolefin separator. The separator was inserted between the electrodes. The cell was secured with 1/4 wide polyimide tape and placed into a bag. 0.4 ml of 1.4 M solution of lithium bis (trifluoromethylsulfonyl) imide, lithium imide in a volume ratio of 42:58 and mixture of 1,3-dioxolane and dimethoxyethane were added as electrolyte and the cell was vacuum sealed. Testing was performed at a discharge current of 0.42 mA/cm² to a voltage of 1.5V and charged at a current 0.24 mA/cm² to 110% last half cycle capacity. The discharge capacity at the 5th cycle was 24 mAh and at the 40th cycle was 22 mAh. The specific discharge capacity at the 40th cycle was 514 mAh/g and at the 100th cycle was 375 mAh/g.

FS CPI EPI GMPI

FA AB; GI

MC CPI: A11-B05; A12-E06A; L03-E01B5B
EPI: X16-A02A; X16-B01F1; X16-E03A1; X16-E08A

PLE UPA 20020524

[1.1] 018; G0339-R G0260 G0022 D01 D12 D10 D26 D51 D53 D63 F41
F89 D11 F34; H0000; H0011-R; M9999 M2073; P0088
[1.2] 018; ND01; Q9999 Q7341 Q7330; Q9999 Q7409 Q7330; K9552
K9483; K9416; B9999 B5243-R B4740; K9701 K9676
[1.3] 018; N9999 N7147 N7034 N7023; N9999 N7103-R N7034 N7023;
N9999 N7090 N7034 N7023; B9999 B5425 B5414 B5403 B5276
[2.1] 018; P0884 P1978 P0839 H0293 F41 D01 D11 D10 D19 D18 D31
D50 D63 D90 E21 E00
[2.2] 018; ND01; Q9999 Q7341 Q7330; Q9999 Q7409 Q7330; K9552
K9483; K9416; B9999 B5243-R B4740; K9701 K9676
[2.3] 018; N9999 N7103-R N7034 N7023; B9999 B5425 B5414 B5403
B5276
[3.1] 018; G0044-R G0033 G0022 D01 D02 D12 D10 D51 D53; H0011-R;

H0000; P1150

[3.2] 018; P1081-R F72 D01

[3.3] 018; ND01; Q9999 Q7341 Q7330; Q9999 Q7409 Q7330; K9552
K9483; K9416; B9999 B5243-R B4740; K9701 K9676

L38 ANSWER 5 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-167146 [22] WPIX

DNN N2002-127849 DNC C2002-051701

TI **Lithium ion secondary battery** used for portable electronic machine and electric vehicle, comprise anode sheets which are **laminated** via collector whose thickness and length satisfies preset relation.

DC L03 X16 X21

PA (TOKE) TOSHIBA KK

CYC 1

PI JP 2001283830 A 20011012 (200222)* 10p H01M004-02

ADT JP 2001283830 A JP 2000-90966 20000329

PRAI JP 2000-90966 20000329

IC ICM H01M004-02

ICS H01M004-58; H01M004-64; H01M010-40

AB JP2001283830 A UPAB: 20020409

NOVELTY - The **lithium ion secondary battery** comprise **anode** sheets (1a, 1b) and cathode sheets (2a, 2b) which are integrally **laminated** through a separator (4). Length (l) (in m), and thickness (S) (in μ m) of the collector (3) of anode sheet satisfies preset relation and length (l) (in m) of the collector and thickness (L) of the active material **layer** of anode satisfies specific relation (II).

DETAILED DESCRIPTION - The anode sheets and cathode sheets are individually **laminated** through collector (3). The **anode** sheet comprises **lithium-metal** complex oxide of formula (1) as anode active material:

M = transition metal chosen from manganese, cobalt and nickel.

The cathode sheet comprises carbon material as cathode active material which can occlude and release lithium ion. The length (l) and thickness (S) of collector of anode sheet satisfies a relation (I). The thickness (L) of the active material **layer** of anode is 50-200 μ m and it satisfies preset relation (II) with length (l) of the collector of anode sheet.

USE - The battery is used for portable electronic machine, electric vehicle and domestic electric power storage.

ADVANTAGE - High volume **lithium ion secondary battery** with improved capacitance, is provided. Safe usage of **lithium ion secondary battery** is enabled.

DESCRIPTION OF DRAWING(S) - The figure shows the sectional view of electrode sheet.

Anode sheets 1a, 1b

Cathode sheets 2a, 2b

Collector 3

Separator 4

Dwg.1/8

FS CPI EPI

FA AB; GI

MC CPI: L03-E01B3; L03-E01B5; L03-H05

EPI: X16-B01F1; X16-E01; X16-E01C1; X21-A01F; X21-B01

L38 ANSWER 6 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-056886 [08] WPIX

CR 2002-272168 [32]

DNN N2002-041934 DNC C2002-016427

TI Non-aqueous-electrolyte **secondary** battery for mobile phones in which a gel-type or plasticizing non-aqueous electrolyte **layer**, a positive electrode and a negative electrode are **laminated**.

DC A85 L03 X16

IN KIMIJIMA, T; SUGIYAMA, T

PA (SONY) SONY CORP; (KIMI-I) KIMIJIMA T; (SUGI-I) SUGIYAMA T

CYC 32

PI EP 1137091 A1 20010926 (200208)* EN 10p H01M010-04

R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
NL PT RO SE SI TR

JP 2001266946 A 20010928 (200208) 8p H01M010-40

NO 2001001399 A 20010924 (200208) H01M004-62

US 2002004171 A1 20020110 (200208) H01M002-18

CN 1316787 A 20011010 (200209) H01M010-38

KR 2001090538 A 20011018 (200221) H01M010-38

TW 535314 A 20030601 (200374) H01M004-04

US 6682853 B2 20040127 (200408) H01M002-16

ADT EP 1137091 A1 EP 2001-107191 20010322; JP 2001266946 A JP 2000-81577
20000323; NO 2001001399 A NO 2001-1399 20010320; US 2002004171 A1 US
2001-815592 20010323; CN 1316787 A CN 2001-119021 20010323; KR
2001090538 A KR 2001-15229 20010323; TW 535314 A TW 2001-106328
20010319; US 6682853 B2 US 2001-815592 20010323

PRAI JP 2000-81577 20000323; JP 2000-59848 20000306

IC ICM H01M002-16; H01M002-18; H01M004-04; H01M004-62; H01M010-04;
H01M010-38; H01M010-40

ICS H01M004-50; H01M004-52; H01M006-00; H01M006-10

AB EP 1137091 A UPAB: 20040202

NOVELTY - Non-aqueous-electrolyte **secondary** battery, in which a gel-type or plasticizing non-aqueous electrolyte **layer**, positive electrode and negative electrode are **laminated**, comprises covering member with insulation, covering position on one electrode opposed to a position exposed at least from an electrolyte **layer** toward the outside in the other electrode in an end of at least either of the electrodes.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(1) a non-aqueous-electrolyte **secondary** battery having insulation and physical strength for electrically insulating one electrode to the other electrode even if pressure is applied to the **laminating** structure; and

(2) a method of manufacturing a non-aqueous electrolyte **secondary** battery which includes covering a position on one electrode opposed to a position exposed at least from an electrolyte **layer** toward the outside in the other electrode in an end of at least either one of a positive electrode or a negative electrode with a covering member having insulation and physical strength capable of keeping an insulation state between the both electrodes, even if pressure is applied to the **laminating** structure before the step of applying pressure to the **laminating** structure from the outside.

USE - Non-aqueous-electrolyte **secondary** battery is used for mobile phones or portable computers.

ADVANTAGE - Electrical short-circuit between the positive and the negative electrode generated by seclusion change or pressure, which is applied to the **laminating** structure from the outside is prevented.

DESCRIPTION OF DRAWING(S) - The figure shows a structure of **lithium** ion polymer **secondary** battery.

Positive electrode 1

Gel-type macromolecular solid electrolyte **layers** 2, 4

Separators 3

Negative electrode 5

Lead electrodes 6, 7

Covering members 8a, 8b, 8c, 8d, 8e, 8f

Laminating structure 10

Dwg.1/2

TECH EP 1137091 A1 UPTX: 20020204

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Battery: The positive electrode has a transition metal chalcogen compound employed as an active material, preferably transition metal sulfide or transition **metal** oxide, or **lithium** complex oxide of formula (I):

M = transition metal selected from cobalt, nickel and manganese; and negative electrode has a material capable of doping and un-doping **lithium** is employed as an active material, preferably a non-graphitizing carbon material and a graphite material. The electrolyte is a solid electrolyte or gel-type electrolyte in which **lithium** salt is included.

A rolled **electrode** is formed by rolling the positive electrode and the negative electrode in a flat spiral shape, and accommodating in a package case, then sealing ends of the package case.

TECHNOLOGY FOCUS - POLYMERS - Preferred Material: The electrolyte is gel-type electrolyte made of a macromolecular compound employing poly(vinylidene fluoride) or poly (vinylidene fluoride-co-hexafluoropropylene) included a non-aqueous solvent and an electrolyte salt.

FS CPI EPI
FA AB; GI
MC CPI: A12-E06A; L03-E03
EPI: X16-B01; X16-B01F
PLE UPA 20020521
[1.1] 018; R00363 G0555 G0022 D01 D12 D10 D51 D53 D58 D69 D82 F-7A; H0000; S9999 S1365
[1.2] 018; R00363 G0555 G0022 D01 D12 D10 D51 D53 D58 D69 D82 F-7A; R00976 G0022 D01 D12 D10 D51 D53 D59 D69 D83 F- 7A; H0022 H0011; S9999 S1365; P0555
[1.3] 018; ND01; Q9999 Q7341 Q7330; Q9999 Q8764; Q9999 Q7818-R; K9698 K9676; K9483-R; K9610 K9483; K9416; B9999 B3270 B3190; B9999 B4091-R B3838 B3747
[1.4] 018; D01; A999 A475

L38 ANSWER 7 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-612402 [71] WPIX
DNN N2001-457175 DNC C2001-183108
TI Graphite nanofibers for electron emitting source and **cathode** of **lithium ion secondary battery** comprises graphene **sheets** having truncated conical shape, sequentially arranged through catalytic metal particles.
DC E36 F01 L03 V05 X16
IN HIRAKAWA, M; MURAKAMI, H; TANAKA, C
PA (ULVA) NIPPON SHINKU GIJUTSU KK; (ULVA) ULVAC CORP; (ULVA-N) ULVAC INC; (HIRA-I) HIRAKAWA M; (MURA-I) MURAKAMI H; (TANA-I) TANAKA C
CYC 29
PI EP 1122344 A2 20010808 (200171)* EN 13p D01F009-127
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI TR
JP 2001288625 A 20011019 (200201) 9p D01F009-127
US 2002009637 A1 20020124 (200210) H01M004-60
KR 2001078216 A 20010820 (200212) H01J001-30
ADT EP 1122344 A2 EP 2001-102417 20010202; JP 2001288625 A JP 2001-4550 20010112; US 2002009637 A1 US 2001-775497 20010205; KR 2001078216 A KR 2001-4600 20010131
PRAI JP 2001-4550 20010112; JP 2000-28001 20000204; JP 2000-28003 20000204
IC ICM D01F009-127; H01J001-30; H01M004-60
ICS C01B031-02; C23C016-26; H01J001-304; H01J009-02; H01J029-04; H01J031-12; H01M004-02; H01M004-58; H01M010-40
AB EP 1122344 A UPAB: 20011203
NOVELTY - A graphite nanofiber having cylindrical structure

comprises graphene sheets (12), each having truncated conical shape, arranged sequentially through catalytic metal particles. Alternatively, small pieces of graphene sheets having a shape adapted for a surface shape of catalytic metal particle, are arranged one over the other in **layers**, through catalytic metal particles.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(1) an electron emitting source which has carbon **layer** comprising graphite nanofibers, **deposited** on electrode substrate (11) or its patterned surface;

(2) preparation of electron emitting source which involves growing a graphene sheet on an electrode substrate or its patterned surface comprising iron, cobalt or their alloy, using carbon containing gas and hydrogen gas, by thermal CVD method, or the method involves dispersing graphite nanofiber powder in a solvent to form a paste and applying the paste on a electrode substrate or immersing electrode substrate into a dispersion of graphite nanofiber powder in solvent and **depositing** graphite nanofibers on the substrate by electro-**deposition**;

(3) a display element having several transparent conductive films with desired pattern, an electron emitting source and a luminous body opposed to carbon **layer**, and designed so that if selecting the carbon **layer** and the transparent conductive film and applying electric voltage, electrons are emitted from the carbon **layers**, so that only a specific portions on luminous body emit light;

(4) a negative electrode carbonaceous material comprising graphite nanofibers; and

(5) a **lithium** ion secondary **battery** which has **anode** including **lithium** transition metal oxide as **anode** active material, cathode including carbonaceous material comprising graphite nanofibers as cathode active material and organic solvent-based electrolyte.

USE - For electron emitting source and **cathode** material of **lithium** ion secondary **battery** (all claimed).

ADVANTAGE - The graphite nanofibers have excellent electron emission characteristics such as high electron emission density and electron emitting ability at low electrical field and high quality as active material for cathodes. The nanofiber provides excellent charging and discharging capacities, to cathode and long life cycle, fast charging ability and high service or discharge capacity, to batteries.

DESCRIPTION OF DRAWING(S) - The figure shows sectional view structure of graphite nanofibers.

Electrode substrate 11

Graphene sheet 12

Through-hole 13

Dwg.2/8

TECH EP 1122344 A2 UPTX: 20011203

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Compounds: The catalytic metal particles comprise iron, cobalt or an alloy comprising at least iron and cobalt.

The cylindrical structure of graphite nanofiber has a through-hole (13), which is vacant or filled with amorphous carbon and a diameter of 10-600 nm.

ABEX EP 1122344 A2 UPTX: 20011203

EXAMPLE - An iron substrate was placed in a CVD device maintained at 1 Pa. A mixed gas of hydrogen gas and carbon monoxide gas was introduced and the temperature was increased to 650degreesC for 30 minutes. A graphene sheet was made to grow on the substrate. By Raman scattering spectra, the resulting layer was found to contain graphite because of the presence of peculiar spectra to graphite. By scanning electron microscope, it was found that several graphite nanofibers grow on the substrate in a curled conditions. Each graphite nanofiber had cylindrical structure in which truncated conical-shaped graphene sheet were arranged on each other through metal catalyst particles. The structure of nanofiber had a through-hole at the center, which was vacant or filled with amorphous carbon. The electron emitting source prepared using graphite nanofiber had electron emission of 100 mA/cm2 at an applied voltage of 5 V/microm. The electron emitting source permitted electron emission at a higher rate even at a very low applied voltage.

KW [1] 2211-0-0-0 CL USE; 2211-0-0-2 CL USE

FS CPI EPI

FA AB; GI; DCN

MC CPI: E31-N04B; E31-N04D; F01-D09A3; F03-C; F04-E; L03-C02A;
L03-E01B3

EPI: V05-M03A1; X16-B01F1; X16-E01C; X16-E01G

DRN 1669-U

CMC UPB 20011203

M3 *01* C106 C810 M411 M424 M781 M904 M905 M910 N120 Q454 Q462 R038
DCN: R01669-K; R01669-U; R05085-K; R05085-U

M3 *02* C106 C730 C810 M411 M424 M781 M904 M905 N120 Q454 Q462 R038
DCN: R01778-K; R01778-U

L38 ANSWER 8 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2001-482921 [52] WPIX

CR 2001-464927 [37]; 2001-464928 [37]

DNN N2001-357532 DNC C2001-144660

TI Preparation of cathode/separator assembly for electrochemical cells, involves forming protective coating layer, and microporous separator layer on temporary substrate, laminating cathode to separator, and removing substrate.

DC A85 L03 X16
 IN CARLSON, S A; PERSON, P C
 PA (MOLT-N) MOLTECH CORP
 CYC 94
 PI WO 2001039294 A2 20010531 (200152)* EN 103p H01M002-00
 RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
 MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
 W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE
 DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG
 KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ
 PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN
 YU ZA ZW

AU 2001017966 A 20010604 (200153) H01M002-00
 ADT WO 2001039294 A2 WO 2000-US32233 20001121; AU 2001017966 A AU
 2001-17966 20001121
 FDT AU 2001017966 A Based on WO 2001039294
 PRAI US 1999-167150P 19991123; US 1999-167149P 19991123
 IC ICM H01M002-00
 AB WO 200139294 A UPAB: 20011129

NOVELTY - A protective coating **layer** (101) is coated on a temporary carrier substrate (2) and a microporous separator **layer** (102) is coated on the protective **layer**. A cathode having a cathode active **layer** (201) is **laminated** on a desired adhesion pattern on the surface of a separator **layer** and the temporary carrier substrate is removed from the protective coating **layer** to form a cathode/separator assembly (51).

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(i) the production of an electrochemical cell which involving providing a cathode/separating assembly, providing an anode, and providing an electrolyte which is contained in pores of a separator **layer**, where the first surface of a protective coating **layer** and the anode are positioned in face to face relationship;

(ii) a cathode/separator assembly of an electrochemical cell; and

(iii) an electrochemical cell.

USE - For electrochemical cells (claimed).

ADVANTAGE - Reduction in roughness and non-uniformity of the anode surface, by calendaring and coating prevents undesirable results from poor mechanical strength and flexibility of the anode and prevents penetration of separator coating material or other coating material into porous areas of anode during coating process. The barrier materials contained in protective **layer** impregnate into the pores of xerogel **layer**, increasing the cycle life of cell by protecting lithium against degradation by electrolyte and increase the manufacturability and reliability of

the cell by mechanically protecting the separator and cathode **layers** against cracking during cell fabrication. The fluorochemical compound contained as release agent in the protective **layer** provides sufficient adhesion for the protective coating **layer** during fabrication and allows for easy delamination when it is desired to remove the temporary carrier substrate. The release agent contained in protective **layer** makes it easier to use less expensive substrate with no need for release treatment on their substrates. Coating of cathode active **layer** and other **layers** on surface of separator **layer** prevents undesirable penetration of pigments and other materials into the separator **layer**. The extremely small pores in microporous xerogel **layer** of separator **layer**, has strong capillary action which enhances the microporous separators to readily wick electrolyte liquids and retain the materials in pores within the separator **layer**.

DESCRIPTION OF DRAWING(S) - The figure shows a representative process flow diagram of method of preparing cathode/separator assembly.

- Temporary carrier substrate 2
- Cathode/separator assembly 51
- Protective coating **layer** 101
- Microporous separator **layer** 102
- Cathode active **layer** 201

Dwg.1/12

TECH WO 200139294 A2UPTX: 20010914

TECHNOLOGY FOCUS - POLYMERS - Preferred **Layers**: The protective coating **layer** is a single ion conducting **layer** which is impervious to dimethoxyethane and 1,3-dioxolane. The protective coating **layer** comprises a microporous xerogel **layer**. The separator **layer** comprises one or more microporous xerogel **layer**. Another protective coating **layer** (II) is coated on the protective coating **layer** (I) formed initially on the substrate, before coating the separator **layer**. The **layer** II is in contact with at least one or more of microporous pseudo-boehmite xerogel **layers** of the separator **layer**. The separator **layer** comprises one or more microporous zirconium oxide xerogel **layers**. An edge insulating **layer** is coated in a desired pattern on the separator **layer** before laminating a cathode to separator **layer**. The edge insulating **layer** comprises an acrylic polymer, insulating non porous polymeric **layer** and a heat expandable polymer **layer** having polymer microcapsule containing a gas. A cathode having laminated **layer** of heat expandable polymer containing polymer microcapsules having gas is laminated to the edge insulating **layer**. The insulating **layer**

is an ionically conductive **layer** which is impervious to dimethoxy ethane and 1,3-dioxolane. The cathode comprises a cathode current collector **layer** on surface of the cathode active **layer** at a side away from the separator **layer**. An electrode insulating **layer** is provided on the cathode current collector **layer** on the side opposite to current collector **layer**.

Preferred Polymers: The protective **layers** comprises polydivinyl poly (ethylene glycol) or polystyrene which is a sulfonated polymer. The xerogel **layer** comprises an organic polymer. The protective **layer** comprises a perfluorinated moiety, as release agent. The cathode active **layer** comprises an electroactive material selected from electroactive metal chalcogenides, electroactive conductive polymer and electroactive sulfur containing organic polymer. The sulfur containing organic polymer in its oxidized state has one or more polysulfide moieties such as $-Sm-$, $-Sm-$ or Sm_2- , where m is an integer at least 3.

Preferred Substrate: The temporary carrier substrate is a flexible web substrate chosen from papers, polymeric films and metals. The flexible web substrate is surface treated with a release agent.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Anode Material: The anode comprises an **anode** active material selected from **lithium metal**, **lithium-aluminum alloy**, **lithium-tin alloy**, **lithium-intercalated carbons** and **lithium-intercalated graphites**.

Preferred Electrolyte Material: The electrolyte material comprises one or more material selected from liquid electrolyte, gel polymer electrolyte, solid polymer electrolyte and single ion conducting electrolyte. Preferably the electrolyte is a liquid electrolyte.

Preferred Cell: The electrochemical cell is a **secondary** or primary cell.

FS CPI EPI

FA AB; GI

MC CPI: A11-B09A2; A12-E06A; A12-E06B; L03-E01A; L03-E01B9

EPI: X16-A02A; X16-B01F1; X16-E01C; X16-F02

PLE UPA 20011129

[1.1] 018; P0000; S9999 S1285-R

[1.2] 018; K9712 K9676; N9999 N7147 N7034 N7023; N9999 N7090
N7034 N7023; N9999 N7136 N7034 N7023; B9999 B5436 B5414
B5403 B5276; B9999 B5447 B5414 B5403 B5276; K9610 K9483;
B9999 B4035 B3930 B3838 B3747; N9999 N7294; ND01; ND07;
K9574 K9483; K9701 K9676; N9999 N7192 N7023; Q9999
Q7818-R; Q9999 Q7341 Q7330; Q9999 Q7409 Q7330

[1.3] 018; A999 A340-R

[2.1] 018; R00351 G1558 D01 D23 D22 D31 D42 D50 D73 D82 F47;
H0000; P0055; P8004 P0975 P0964 D01 D10 D11 D50 D82 F34;

M9999 M2153-R; M9999 M2813
 [2.2] 018; R00708 G0102 G0022 D01 D02 D12 D10 D19 D18 D31 D51
 D53 D58 D76 D88; H0000; M9999 M2799; P1741; P1752
 [2.3] 018; D01; P0000; S9999 S1365
 [2.4] 018; Q9999 Q7114-R; N9999 N7090 N7034 N7023; N9999 N7147
 N7034 N7023; B9999 B5447 B5414 B5403 B5276; N9999 N7136
 N7034 N7023; B9999 B5436 B5414 B5403 B5276; K9610 K9483;
 Q9999 Q7227 Q7114; K9552 K9483; K9563 K9483; B9999 B3269
 B3190; B9999 B5221 B4740; B9999 B4864 B4853 B4740; B9999
 B5301 B5298 B5276; ND01; ND07; K9574 K9483; K9701 K9676;
 N9999 N7192 N7023; Q9999 Q7818-R; Q9999 Q7341 Q7330; Q9999
 Q7409 Q7330
 [2.5] 018; S- 6A; H0157
 [2.6] 018; D01 D69 F- 7A; A999 A340-R
 [3.1] 018; P0088-R
 [3.2] 018; P0000; S9999 S1398
 [3.3] 018; Q9999 Q7114-R; N9999 N7147 N7034 N7023; K9610 K9483;
 B9999 B3270 B3190; B9999 B5141 B4740; B9999 B3269 B3190;
 B9999 B4864 B4853 B4740; ND01; ND07; K9574 K9483; K9701
 K9676; N9999 N7192 N7023; Q9999 Q7818-R; Q9999 Q7341
 Q7330; Q9999 Q7409 Q7330
 [4.1] 018; D01 F02; P0000
 [4.2] 018; B9999 B3269 B3190; ND01; ND07; K9574 K9483; K9701
 K9676; N9999 N7192 N7023; Q9999 Q7818-R; Q9999 Q7341
 Q7330; Q9999 Q7409 Q7330

L38 ANSWER 9 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 2001-467795 [51] WPIX
 DNN N2001-347059 DNC C2001-141267
 TI **Lithium battery**, useful in personal computer,
 comprising electrode body and electrode pressurizing means to
 pressurize electrode body in **lamination** direction of
 positive and negative electrodes.
 DC L03 X16
 PA (TOYW) TOYOTA CHUO KENKYUSHO KK
 CYC 1
 PI JP 2001093577 A 20010406 (200151)* 10p H01M010-40
 ADT JP 2001093577 A JP 1999-266196 19990920
 PRAI JP 1999-266196 19990920
 IC ICM H01M010-40
 ICS H01M004-02; H01M004-04; H01M004-58
 AB JP2001093577 A UPAB: 20010910
NOVELTY - A lithium secondary battery
 comprises an **electrode** body where a sheet-form positive
electrode, containing a **lithium** transition
metal composite oxide, being of crystal structure being
 lay-form rock salt structure, as a positive electrode active
 material are **laminated** through a separator; and an

electrode body pressurizing means to always pressurize the electrode body in the **lamination** direction of the positive electrode and the negative electrode at a pressure of at least 5 kg/cm².

USE - Useful in a personal computer and a video camera.

ADVANTAGE - Lowering of conductivity of the internal part of a positive electrode is sufficiently suppressed.

Dwg.0/6

ABEX JP 2001093577 AUPTX: 20010910

EXAMPLE - A positive electrode contains a lithium transition metal composite oxide as a positive electrode active material. A typical composite oxide includes a lithium cobalt composite oxide, a lithium nickel composite oxide, and a lithium manganese composite oxide. A negative electrode preferably uses an absorbing and releasing carbon material. A typical carbon material includes natural graphite, spherical or fibrous artificial graphite, and an organic compound burnt material, such as phenol resin.

FS CPI EPI

FA AB

MC CPI: L03-E01B5

EPI: X16-B01F; X16-E01; X16-E01C; X16-E01G

L38 ANSWER 10 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2001-260467 [27] WPIX

DNN N2001-185922 DNC C2001-078871

TI Non-aqueous **secondary battery** for portable telephone, personal computer, has **lithium** containing **metallic foil on cathode sheet** through support **layer** and electrolyte containing hydrazine derivative and/or aromatic compound.

DC L03 X16 X21

PA (FUJF) FUJI PHOTO FILM CO LTD

CYC 1

PI JP 2001015172 A 20010119 (200127)* 13p H01M010-40

ADT JP 2001015172 A JP 1999-240599 19990826

PRAI JP 1999-118296 19990426

IC ICM H01M010-40

ICS H01M004-02; H01M004-58

AB JP2001015172 A UPAB: 20010518

NOVELTY - The battery has non-aqueous electrolyte containing hydrazine derivative and/or aromatic compound, and anode sheet (1) containing positive electrode active material essentially comprising complex oxide of **lithium** and transition **metal**. A **metallic foil** containing **lithium** is **laminated** on **cathode sheet** (2) through support **layer**.

DETAILED DESCRIPTION - The **cathode sheet** can occlude **lithium** and release carbon material.

An INDEPENDENT CLAIM is also included for manufacturing method

of non-aqueous secondary battery.

USE - The non-aqueous secondary battery is used for portable telephone, personal computer and also for motor vehicles.

ADVANTAGE - Non-aqueous secondary battery has high volume.

DESCRIPTION OF DRAWING(S) - The figure shows the conceptual diagram of cylindrical secondary battery.

Anode sheet 1

Cathode sheet 2

Dwg.1/1

FS CPI EPI

FA AB; GI

MC CPI: L03-E03; L03-H05

EPI: X16-B01F; X16-E02; X21-A01F; X21-B01A

L38 ANSWER 11 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2000-202443 [18] WPIX

DNN N2000-150924 DNC C2000-062381

TI **Lithium ion secondary battery** for use
in motor vehicles and electrically driven wheel chairs comprises
cylindrical electrode **laminate** provided on metal
container.

DC A85 G02 L03 X16

PA (KOSE-N) KOSERU KK; (NIPP-N) NIPPEI TOYAMA KK; (NISC) NISSAN CHEM
IND LTD; (TODO-N) TODO KOGYO KK; (TOYA-N) TOYAMA KEN

CYC 1

PI JP 2000040529 A 20000208 (200018)* 5p H01M010-40

ADT JP 2000040529 A JP 1998-207257 19980723

PRAI JP 1998-207257 19980723

IC ICM H01M010-40

ICS C09D005-24; C09D163-00; H01M002-22; H01M002-26

AB JP2000040529 A UPAB: 20000419

NOVELTY - **Lithium ion secondary battery**
comprises cylindrical **electrode laminate** (14),
(formed by **laminating** positive electrode, negative
electrode and separator) provided on a metal container (12). A
collector is configured on the edge portion of the electrode
laminate. A conductive paint (20) containing nickel powder,
electrically connects collector and metal container.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included
for the manufacture of **lithium ion secondary**
battery. The positive **electrode** is formed by
applying positive **electrode** material containing
lithium compound to **metal** plate (22). Similarly,
the negative electrode is formed by applying negative electrode
material to another metal sheet surface. The positive electrode,
negative electrode and the separator are sequentially
laminated and wound cylindrically to form electrode
laminate. The conductive resin containing nickel powder,

applied between collector and metal container is hardened at 50-100 deg. C.

USE - For use in motor vehicles, power storage batteries and electrically driven wheel chairs.

ADVANTAGE - The electrode **laminate** is reliably and easily connected to an external electrode. The battery is durable and safe even during conduction of heavy currents. The battery can be manufactured economically.

DESCRIPTION OF DRAWING - The figure shows cross sectional view of **lithium ion secondary battery**.

(12) Metal container; ; (14) Electrode **laminate**; ; (16) Positive electrode collector; ; (18) Negative electrode collector; ; (20) Conductive paint; ; (22) Metal plate.

Dwg.1/2

FS CPI EPI

FA AB; GI

MC CPI: A08-M09A; A09-A03; A12-E06; A12-T04; G02-A05B; L03-E03

EPI: X16-B01F; X16-F03

PLE UPA 20000606

[1.1] 018; P0464-R D01 D22 D42 F47; M9999 M2073

[1.2] 018; ND01; Q9999 Q7818-R; Q9999 Q7341 Q7330; K9905; B9999 B5287 B5276; B9999 B3269 B3190; K9676-R; K9552 K9483; K9483-R; Q9999 Q9234 Q9212; Q9999 Q9289 Q9212; Q9999 Q8059 Q7987

[1.3] 018; D00 D09 Ni 8B Tr; A999 A135; S9999 S1514 S1456

[1.4] 018; D01 D60 F35-R; A999 A793

L38 ANSWER 12 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2000-042093 [04] WPIX

DNN N2000-031920 DNC C2000-011357

TI **Electrode** for non-aqueous electrolyte **lithium secondary cell** - has holes in **anode** and **cathode** collectors for attaching **lithium metallic foil** to one surface of mixture **layer**.

DC L03 X16

PA (FUJF) FUJI FILM CELLTECH KK; (FUJF) FUJI PHOTO FILM CO LTD

CYC 1

PI JP 11283676 A 19991015 (200004)* 17p H01M010-40

ADT JP 11283676 A JP 1998-86940 19980331

PRAI JP 1998-86940 19980331

IC ICM H01M010-40

ICS H01M004-38; H01M004-58; H01M004-70

AB JP 11283676 A UPAB: 20000203

NOVELTY - Holes (54a,54b) are provided in a positive electrode collector (23) and a negative **electrode** collector (26). A

lithium metallic foil (53) is attached to one surface of a mixture **layer** (27b). The mixture

layer is provided to both sides of the collector.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for the non-aqueous electrolyte **lithium** secondary **battery** manufacturing method.

USE - For non-aqueous electrolyte **lithium** secondary **battery**.

ADVANTAGE - Since mixture **layer** is provided to both sides of the collectors, potential non-uniformity is reduced. Since holes are provided in the collectors, there is no need to attach **lithium metallic** foil to both sides of electrodes and therefore manufacturing cost is reduced.

DESCRIPTION OF DRAWING - The figure shows the sectional drawing of winding electrode group. (23) Positive electrode collector; (26) Negative **electrode** collector; (27b) Mixture **layer**; (53) **Lithium metallic** foil; (54a,54b) Holes.

Dwg.1/3

FS CPI EPI
FA AB; GI
MC CPI: L03-E03
EPI: X16-E02; X16-E08A

L38 ANSWER 13 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2000-042074 [04] WPIX

DNN N2000-031901 DNC C2000-011338

TI Coating **electrode** on metal **foil** collector for **lithium secondary cell** - involves removing **electrode** mixture adhering on non-coating region of collector by brush.

DC L03 X16

PA (SONY) SONY CORP

CYC 1

PI JP 11283613 A 19991015 (200004)* 5p H01M004-04

ADT JP 11283613 A JP 1998-83116 19980330

PRAI JP 1998-83116 19980330

IC ICM H01M004-04

ICS H01M004-64; H01M010-40

AB JP 11283613 A UPAB: 20000203

NOVELTY - Electrode mixture is intermittently and selectively applied over a metallic foil collector (1). The electrode material that is **adhered** on the non-coating region (1b) is then removed using a brush.

USE - For coating electrode mixture on metallic foil collector used in non-aqueous **lithium** ion secondary **battery**

ADVANTAGE - Electrode material can be coated to metallic foil collector at high speed with high precision. Quality of metallic foil collector is improved by the removal of electrode material **adhered** on the non-coating region.

DESCRIPTION OF DRAWING - The figure shows the outline of high speed rotation brush of the metallic foil collector. (1) Metallic foil collector; (1b) Non-coating region.

Dwg.2/6

FS CPI EPI
FA AB; GI
MC CPI: L03-E01B
EPI: X16-E02; X16-E08A

L38 ANSWER 14 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1999-362874 [31] WPIX
DNN N1999-270884 DNC C1999-107204

TI **Cathode for lithium secondary battery** - has carbonaceous powder **layer** formed on surface of **metallic lithium foil**.

DC L03 X16

PA (FJIC) FUJI ELECTROCHEMICAL CO LTD

CYC 1

PI JP 11135116 A 19990521 (199931)* 5p H01M004-38

ADT JP 11135116 A JP 1997-294624 19971027

PRAI JP 1997-294624 19971027

IC ICM H01M004-38

ICS H01M004-02; H01M004-40; H01M004-58; H01M010-40

AB JP 11135116 A UPAB: 19990819

NOVELTY - The negative electrode (2) consists of a carbonaceous powder **layer** (2b) formed on the surface of **metallic lithium foil** (2a) or lithium alloy **layer**.

USE - For **lithium battery**.

ADVANTAGE - Since carbonaceous powder **layer** is formed on the surface of the lithium alloy **layer**, the discharge characteristic at the time of pulse discharge is improved. Since the film of solid coating for the electrolyte is provided, the reaction of the lithium with electrolyte is prevented.

DESCRIPTION OF DRAWING(S) - The figure shows the expanded sectional view of negative **electrode**. (2) Negative **electrode**; (2a) **Metallic lithium foil**; (2b) Carbonaceous powder **layer**.

Dwg.1/5

FS CPI EPI
FA AB; GI
MC CPI: L03-E01B5
EPI: X16-B01F1; X16-E01C

L38 ANSWER 15 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1999-238557 [20] WPIX
DNN N1999-177824 DNC C1999-070014

TI **Electrode plate for lithium secondary**

battery - includes active material **layer** containing **lithium** compound **layer** with **lithium** carbonate and **lithium** metal particle formed on collector containing copper foil.

DC L03 X16

PA (RICO) RICOH KK

CYC 1

PI JP 11067208 A 19990309 (199920)* 22p H01M004-58

ADT JP 11067208 A JP 1997-231848 19970813

PRAI JP 1997-231848 19970813

IC ICM H01M004-58

ICS H01M004-02; H01M004-04; H01M004-40; H01M010-40

AB JP 11067208 A UPAB: 19990525

NOVELTY - An active material **layer** containing a **lithium** compound **layer** with 80 wt% of **lithium** carbonate and **lithium** metallic particles (13) is formed on a collector (10). The collector contains copper foil. The thickness of collector and active material **layer** is 80 μ m.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for manufacturing method of electrode plate.

USE - For **lithium** secondary **batteries**, portable apparatus.

ADVANTAGE - Dendrite formation is suppressed as **lithium** compound **layer** contains fluoride **lithium** other than **lithium** carbonate, thereby offering **battery** which performs good charging and discharging operation. As capacitance of **electrode** does not reduce, **lithium** secondary **battery** of high volume is offered.

DESCRIPTION OF DRAWING(S) - The figure depicts sectional view of **electrode** plate for **lithium** secondary **battery**. (10) Collector; (13) **Lithium** metallic particle.

Dwg.1/4

FS CPI EPI

FA AB; GI

MC CPI: L03-E01B5

EPI: X16-E08A

L38 ANSWER 16 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1999-220400 [19] WPIX

DNN N1999-163237 DNC C1999-064651

TI Closed type non-aqueous electrolyte **secondary** battery - where the cathode, anode and separator are **laminated** together or wound and inserted in a battery can.

DC L03 X16

PA (FUJF) FUJI FILM CELLTECH KK; (FUJF) FUJI PHOTO FILM CO LTD

CYC 1

PI JP 11054147 A 19990226 (199919)* 14p H01M010-40

ADT JP 11054147 A JP 1997-207906 19970801

PRAI JP 1997-207906 19970801

IC ICM H01M010-40

ICS H01M002-34; H01M004-02; H01M004-58

AB JP 11054147 A UPAB: 19990518

A non-aqueous electrolyte **secondary** battery comprises a positive electrode sheet having a **layer** consisting mainly of a **lithium** contained **metallic** oxide; a negative **electrode** sheet consisting mainly of a negative **electrode** material to store and discharge **lithium**; non-aqueous electrolyte containing lithium salt; and a separator. The positive electrode sheet, a negative electrode sheet, and a separator (4) are **laminated** together or wound and inserted in a battery can, and the electrolyte is injected. An internal space volume of the battery after a battery can (1) being sealed is 2-30% of a space volume when non-aqueous electrolyte is not filled.

USE - This **secondary** battery is used in a note book type personal computer and a portable telephone.

ADVANTAGE - Preserving characteristics are high and a good cycle is provided.

Dwg.1/1

FS CPI EPI

FA AB; GI

MC CPI: L03-E03

EPI: X16-B01F; X16-E01C1; X16-E08

L38 ANSWER 17 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1999-220367 [19] WPIX

DNN N1999-163204 DNC C1999-064620

TI Cathode for non-aqueous electrolyte **secondary battery** - includes porous metallic **sheet** that is coated with **lithium** ion occlusion material.

DC L03 X16

PA (MATU) MATSUSHITA DENKI SANGYO KK

CYC 1

PI JP 11054112 A 19990226 (199919)* 4p H01M004-02

ADT JP 11054112 A JP 1997-205669 19970731

PRAI JP 1997-205669 19970731

IC ICM H01M004-02

ICS H01M010-40

AB JP 11054112 A UPAB: 19990518

NOVELTY - In between porous metallic sheets (1), with a coating of lithium ion releasing or occlusion material, lithium (3) is filled. Both outer surfaces of the sheet is **laminated** with active material **layer** (2). The lithium ion occlusion material is applied on the surface opposite the surface where the lithium ion releasing material is not applied.

USE - For non-aqueous electrolyte **secondary battery**

e.g. **lithium dry battery.**

ADVANTAGE - Facilitates high volume charging and discharging of the **battery** by preventing formation of irreversible **lithium** during discharge. DESCRIPTION OF DRAWING(S) - The figure depicts a cross-sectional block diagram of the negative electrode before and after bending metal sheet. (1) Porous metallic sheet; (2) Active material **layer**; (3) Lithium.

Dwg.1/2

FS CPI EPI

FA AB; GI

MC CPI: L03-E01B; L03-E03

EPI: X16-B01F; X16-B01F1; X16-E08; X16-E08A

L38 ANSWER 18 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1998-486401 [42] WPIX

DNN N1998-379945 DNC C1998-146794

TI Non-aqueous electrolyte **secondary** battery for electronic device - has **anode** with **laminated lithium** content **metal oxide layer** in which lithium discharge potential of third **layer** is higher than that of active material **layer**.

DC L03 X16 X21

PA (NIST) JAPAN STORAGE BATTERY CO LTD

CYC 1

PI JP 10208730 A 19980807 (199842)* 5p H01M004-02

ADT JP 10208730 A JP 1997-25985 19970124

PRAI JP 1997-25985 19970124

IC ICM H01M004-02

ICS H01M004-58; H01M010-40

AB JP 10208730 A UPAB: 19981028

The battery (1) has an anode having **laminated** anode mixture **layer**. The **laminated layer** has

lithium content **metal oxide** as active material **layer** and releases **lithium** ions during occlusion.

A **cathode** contains a mixture **layer** containing specific reactant for releasing **lithium** ions. The third **layer** of **anode** mixture **layer** has high **lithium** discharging potential higher than the active material **layer**. After initial charging is over, the first specific reaction substance is consumed in the process.

USE - For electric vehicle.

ADVANTAGE - Provides irreversible capacitive component to cathode to improve discharge capacitance. Has high volume characteristics due to present of amorphous carbon.

Dwg.1/2

FS CPI EPI

FA AB; GI

MC CPI: L03-E01B; L03-H05

EPI: X16-B01F1; X16-E01C; X21-A01F; X21-B01A

L38 ANSWER 19 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1998-419416 [36] WPIX

DNN N1998-327146 DNC C1998-126298

TI Non aqueous **secondary battery** - has
anode sheet with **layer** of
lithium containing **metallic oxide**, **cathode**
sheet containing composite agent, non-aqueous electrolyte
 etc..

DC L03 X16

PA (FUJF) FUJI FILM CELLTECH KK

CYC 1

PI JP 10172605 A 19980626 (199836)* 14p H01M010-40

ADT JP 10172605 A JP 1996-335955 19961216

PRAI JP 1996-335955 19961216

IC ICM H01M010-40

ICS H01M004-02; H01M004-58

AB JP 10172605 A UPAB: 19980911

A non aqueous secondary battery comprises a positive electrode sheet having a **layer** mainly composed of **Li** containing **metallic oxide**, a **cathode** sheet having a composite agent **layer** mainly composed of a cathode material, a non aqueous electrolyte including Li salt, and a separator. At least one kind of chain-type hydrocarbon is included in the non aqueous electrolyte.

ADVANTAGE - High discharging capacity and high charging and discharging cycle property.

Dwg.0/2

FS CPI EPI

FA AB

MC CPI: L03-E01B5; L03-E01C

EPI: X16-B01F; X16-E01C

L38 ANSWER 20 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1998-379305 [33] WPIX

DNN N1998-296603 DNC C1998-115247

TI **Sheet type lithium secondary battery** e.g. for cellular phones, personal computers etc. - has separator, impregnated with nonaqueous liquid electrolyte and set between active material **layers** of negative and positive electrode **sheets**.

DC L03 T01 W01 X16

IN IJIRI, Y; ZUSHI, T

PA (DAIE) MITSUBISHI CABLE IND LTD

CYC 28

PI EP 854529 A1 19980722 (199833)* EN 17p H01M010-40

R: AL AT BE CH DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL

PT RO SE SI

JP 10172565 A 19980626 (199836) 6p H01M004-58
 JP 10172607 A 19980626 (199836) 5p H01M010-40
 JP 10172608 A 19980626 (199836) 5p H01M010-40
 CA 2223370 A 19980605 (199839) H01M010-24
 TW 350149 A 19990111 (199923) H01M002-02
 KR 98063834 A 19981007 (199949) H01M010-04

ADT EP 854529 A1 EP 1997-121227 19971203; JP 10172565 A JP 1996-331091
 19961211; JP 10172607 A JP 1996-325485 19961205; JP 10172608 A JP
 1996-325488 19961205; CA 2223370 A CA 1997-2223370 19971203; TW
 350149 A TW 1997-118295 19971205; KR 98063834 A KR 1997-66243
 19971205

PRAI JP 1996-331091 19961211; JP 1996-325485 19961205; JP 1996-325488
 19961205

IC ICM H01M002-02; H01M004-58; H01M010-04; H01M010-24; H01M010-40
 ICS H01M002-18; H01M004-02; H01M004-10; H01M010-38

AB EP 854529 A UPAB: 19980819.
 The **lithium** secondary **battery** comprises a
 negative **electrode** sheet (1) with an active material
layer (12) on one side and a positive electrode sheet (2)
 with active material **layers** (22) on both sides which is
 inserted between flaps of a negative electrode sheet which is in
 turn folded with the active material inside. A separator (3)
 impregnated with a non-aqueous liquid electrolyte is set between the
 active material **layers**. The negative electrode active
 material **layer** is graphite with an effective capacity of
 100 - 110 mAh / 100 mAh. The positive **electrode** active
 material is **Li** containing transition **metal**
 oxide. The separator sheets are **adhered** together to form a
 bag enclosing the electrodes to prevent their movement and the whole
 is enclosed in a sheathing sheet (4).

USE - Sheet type **lithium** secondary **batteries**
 used e.g. for cellular phones and PC's.

ADVANTAGE - The electrode sheets have been folded to increase
 the capacity of the battery and the battery is free from the
 occurrence of dendrite.

Dwg.2/8

FS CPI EPI
 FA AB; GI
 MC CPI: L03-E03
 EPI: T01-L01; W01-C01D3; W01-C01E5B; X16-B01; X16-B01F

L38 ANSWER 21 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 1998-222628 [20] WPIX
 DNN N1998-176485 DNC C1998-070089
 TI **Lithium** negative **electrode** manufacturing method
 e.g. for **secondary battery** used in PC, portable
 telephone - involves producing **foil-like lithium**

in argon atmosphere, which is used as cathode.

DC L03 X16
 PA (FUIT) FUJITSU LTD
 CYC 1
 PI JP 10064523 A 19980306 (199820)* 4p H01M004-04
 ADT JP 10064523 A JP 1996-218837 19960820
 PRAI JP 1996-218837 19960820
 IC ICM H01M004-04
 ICS H01M004-02; H01M004-58; H01M010-40
 AB JP 10064523 A UPAB: 19980520

The method involves producing a foil-like **Li metal**

(4) in Ar atmosphere whose moisture content is about 10-500 ppm. The **Li** foil is used as **cathode** for the battery (10).

The cathode has a surface **layer** in which ratio of LiOH/Li₂CO₃ is about 0.2-0.5.

ADVANTAGE - Suppresses precipitate growth on cathode. Reduces dendrite formation.

Dwg.2/4

FS CPI EPI
 FA AB; GI
 MC CPI: L03-E01B5
 EPI: X16-B01F1; X16-E01C1; X16-E01G
 DRN 1366-U; 1513-U

L38 ANSWER 22 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 1998-116930 [11] WPIX
 CR 1999-087192 [08]
 DNN N1998-093842 DNC C1998-038532

TI **Lithium secondary battery** used in electric vehicle, memory card, medical equipment e.g. pacemaker, hearing aid and various electronic device - has cathode having copper **laminate** with carbon powder that carries minute metal particles that form alloy with **lithium** and **metal** particles that do not form alloy with **lithium** or inter-metallic compounds.

DC L03 Q14 X16
 IN HONBO, H; MURANAKA, Y; TAKEUCHI, S; YAMAUCHI, S; YOSHIKAWA, M
 PA (HITA) HITACHI LTD
 CYC 4

PI JP 10003907 A 19980106 (199811)* 7p H01M004-40
 KR 98086348 A 19981205 (200009) H01M004-38
 US 6030726 A 20000229 (200018) H01M004-02
 JP 3188395 B2 20010716 (200142) 7p H01M004-58
 CN 1170243 A 19980114 (200323) H01M004-02
 ADT JP 10003907 A JP 1996-155115 19960617; KR 98086348 A KR 1997-24797
 19970616; US 6030726 A US 1997-866250 19970605; JP 3188395 B2 JP
 1996-155115 19960617; CN 1170243 A CN 1997-112800 19970616
 FDT JP 3188395 B2 Previous Publ. JP 10003907

PRAI JP 1996-155115 19960617; JP 1997-129486 19970520

IC ICM H01M004-02; H01M004-38; H01M004-40; H01M004-58

ICS H01M004-50; H01M010-40

AB JP 10003907 A UPAB: 20030407

Battery comprises an anode (15) that includes an aluminium foil applied with active material compressing LiCoO₂ and artificial graphite. A cathode (17) includes a copper **laminate** with carbon powder carrying minute metal particles that form along with **lithium** and **metal** particles that do not form alloy with lithium or intermetallic compounds. A porous film separator (19) made of polyethylene is arranged between each anode and cathode.

USE - Used for memory backup, portable equipment drive, cordless telephone, headphone stereo, handy cleaner, portable CD, electric shaver, power tool, electronic translator and other consumer appliances, WP, notebook PC, portable telephone, portable facsimile and printer, LCTV, transceiver and vehicle telephone.

ADVANTAGE - The battery improves charging and discharging characteristics.

Dwg.4/4

FS CPI EPI GMPI

FA AB; GI

MC CPI: L03-E01B3

EPI: X16-B01F1; X16-E01C

L38 ANSWER 23 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1997-456792 [42] WPIX

DNN N1997-380470 DNC C1997-145792

TI Non-aqueous **secondary battery** for multitude of applications - has positive and negative electrode **sheets** of specified chemical composition as described, with separator, including **lithium** salts.

DC L03 X16

IN KABUTOMORI, M; TOMIYAMA, H

PA (FUJF) FUJI PHOTO FILM CO LTD

CYC 2

PI US 5665491 A 19970909 (199742)* 12p H01M006-14

JP 09223496 A 19970826 (199744) 12p H01M004-02

ADT US 5665491 A US 1996-764728 19961210; JP 09223496 A JP 1996-272280 19961015

PRAI JP 1995-321507 19951211

IC ICM H01M004-02; H01M006-14

ICS H01M004-58; H01M010-40

AB US 5665491 A UPAB: 19971021

The battery comprises a positive electrode sheet (1) having, on current collector, an **electrode** material mixture **layer** containing a **lithium**-containing transition **metal** oxide as positive electrode active material. A

negative electrode sheet (2) has, on collector, an electrode material mixture **layer** containing a negative electrode material capable of intercalating and deintercalating lithium. A non-aqueous electrolyte contains a **lithium** salt in positive **electrode** sheet or negative electrode sheet. Other features shown are separator (3), battery case (4), cap (5), gasket (6) and safety valve (7).

In positive sheet, a **layer** containing no positive electrode active material is provided between number electrode material mixture **layers** containing the positive electrode active material or between the electrode material mixture **layer** and the current collector. In negative electrode sheet, a **layer** containing no negative electrode material capable of intercalating and deintercalating lithium is provided between a number of electrode material mixture **layers** containing the negative electrode material, or between the electrode material mixture **layer** and the current collector.

USE/ADVANTAGE - For computers, pagers, vehicles, and many other applications. Flexibility of positive electrode sheet improved. Electrode material mixture on positive sheet prevented from falling off.

Dwg.1/1

FS CPI EPI
FA AB; GI
MC CPI: L03-E02
EPI: X16-B01F1; X16-E01C1

L38 ANSWER 24 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1997-425279 [39] WPIX

DNN N1997-354215 DNC C1997-136167

TI Non-aqueous **secondary battery** with high discharge capacity - comprises **lithium**-containing **anode** and **cathode sheets**, **lithium** salt-containing non-aqueous electrolyte and separator enclosed in a can, useful for personal computers, mobile phones etc..

DC L03 X16

IN YASUNAMI, S

PA (FUJF) FUJI PHOTO FILM CO LTD

CYC 65

PI WO 9730487 A1 19970821 (199739)* JA 43p H01M010-40

RW: AT BE CH DE DK EA ES FI FR GB GR IE IT KE LS LU MC MW NL OA
PT SD SE SZ UG

W: AL AU BA BB BG BR CA CN CU CZ EE GE HU IL IS JP KR LC LK LR
LT LV MG MK MN MX NO NZ PL RO SG SI SK TR TT UA US UZ VN YU

AU 9716724 A 19970902 (199751) H01M010-40

EP 895295 A1 19990203 (199910) EN H01M010-40

R: DE FR

JP 09529197 X 19990427 (199927) H01M010-40
 CN 1211345 A 19990317 (199930) H01M010-40
 US 6371995 B1 20020416 (200232) H01M010-38

ADT WO 9730487 A1 WO 1997-JP406 19970214; AU 9716724 A AU 1997-16724
 19970214; EP 895295 A1 EP 1997-902696 19970214, WO 1997-JP406
 19970214; JP 09529197 X JP 1997-529197 19970214, WO 1997-JP406
 19970214; CN 1211345 A CN 1997-192349 19970214; US 6371995 B1 WO
 1997-JP406 19970214, US 1998-125146 19980811

FDT AU 9716724 A Based on WO 9730487; EP 895295 A1 Based on WO 9730487;
 JP 09529197 X Based on WO 9730487; US 6371995 B1 Based on WO 9730487

PRAI JP 1996-28978 19960216

REP JP 4355066; JP 6290811; JP 7235295

IC ICM H01M010-38; H01M010-40
 ICS H01M004-58

AB WO 9730487 A UPAB: 19970926
 A non-aqueous secondary battery comprises an anode sheet with a
layer composed mainly of a **lithium**-containing
metal oxides, a **cathode** sheet having a mixture
layer of mainly a cathode material on which a metallic
 material consisted of lithium is laid, a lithium salt-containing
 non-aqueous electrolyte and a separator enclosed in a battery can in
 a wound state, for low temperature ageing then high temperature
 ageing after charging-discharging.

USE - The battery is for electronic goods, e.g. PCs,
 word-processors, mobile phones, portable printers, liquid-crystal
 TVs, portable CDs, calculators, electric vehicles, motors. lamps,
 toys, electronic games, medical appliances and solar cells.

ADVANTAGE - Said battery has high discharge capacity, excellent
 charging-discharging cycle characteristics and high energy density.

Dwg.1/1

FS CPI EPI

FA AB; GI

MC CPI: L03-E01B5
 EPI: X16-B01F1; X16-E01C1

DRN 1544-U; 1669-U; 1778-U

L38 ANSWER 25 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1997-383184 [35] WPIX

DNN N1997-319000 DNC C1997-122786

TI Non-aqueous **secondary battery** for electronic
 device, video camera, etc. - has agent **layers** in positive
 electrode **sheet** with differing positive active material.

DC L03 X16

IN TOMIYAMA, H

PA (FUJF) FUJI PHOTO FILM CO LTD

CYC 2

PI JP 09167618 A 19970624 (199735)* 11p H01M004-58
 US 5677083 A 19971014 (199747) 11p H01M006-14

ADT JP 09167618 A JP 1995-330116 19951219; US 5677083 A US 1996-769525
19961219

PRAI JP 1995-330116 19951219

IC ICM H01M004-58; H01M006-14

ICS H01M004-02; H01M010-40

AB JP 09167618 A UPAB: 19970828

The battery has a sheet like positive electrode (1) which contains the positive active material selected from the **lithium** content transition **metal** oxide. A sheet like negative electrode (2) is formed from the negative **electrode** material like **lithium**. The occlusion/emission is possible in the negative electrode.

The **lithium** metal salt is provided in the non-aqueous electrolyte. The positive electrode sheet consists of two or more agent **layers**, with adjacent **layers** of differing positive active material.

ADVANTAGE - The battery prevents spilling of electrolytic liquid; and provides excellent charging and discharging characteristic.

Dwg.1/1

ABEQ US 5677083 A UPAB: 19971125

A non-aqueous **lithium** ion secondary **battery** has an **anode** sheet which comprises a **lithium** -containing transition **metal** oxide film; a cathode sheet which has a film of material capable of receiving and releasing a lithium ion, a non-aqueous electrolyte which contains a lithium salt, and a container which seals the **electrodes** and electrolyte. The **lithium**-containing transition **metal** oxide film comprises at least two **layers**, one of which expands during discharging while shrinks during charging, and another of which shrinks during discharging while expands during charging.

Dwg.1/1

FS CPI EPI

FA AB; GI

MC CPI: L03-E01B5

EPI: X16-B01F; X16-B01X; X16-E01; X16-E01C

L38 ANSWER 26 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1997-218271 [20] WPIX

DNN N1997-180250 DNC C1997-070094

TI Organic electrolyte **secondary battery** with good adhesion between paint **layer** and metal **foil** collector - has cathode painted with film contg. binder and carbon having graded particle size.

DC L03 X16

PA (HITM) HITACHI MAXELL KK

CYC 1

PI JP 09063588 A 19970307 (199720)* 6p H01M004-58
ADT JP 09063588 A JP 1995-239211 19950823
PRAI JP 1995-239211 19950823
IC ICM H01M004-58
ICS H01M010-40

AB JP 09063588 A UPAB: 19970516

The organic electrolyte secondary **battery** uses **anode** active material of Li contg. transition **metal** chalcogenide, and **cathode** formed by painting a film contg. a mixture of carbon and binder. The carbon has graded particle size with $P1/P0 < 0.9$, where $P0$ = average dia. of whole carbon and $P1$ = average dia. of carbon in the region having thickness of $> 1 \mu m$.

ADVANTAGE - The organic electrolyte secondary battery has good adhesion between paint **layer** of mixture of carbon and binder and metal foil collector.

Dwg.1/1

FS CPI EPI

FA AB; GI

MC CPI: L03-E01C

EPI: X16-B01F1; X16-E01C

L38 ANSWER 27 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1996-168953 [17] WPIX
DNN N1996-142132 DNC C1996-053199
TI Square type **lithium secondary battery**

- in which negative and positive plates consisting of member storable and dischargeable of **lithium metal** are **laminated** through separator and are contained square cast.

DC L03 X16

PA (MITQ) MITSUBISHI ELECTRIC CORP; (TOTA-N) TOYO TAKASAGO KANDENCHI KK

CYC 1

PI JP 08050920 A 19960220 (199617)* 8p H01M010-38

ADT JP 08050920 A JP 1994-186052 19940808

PRAI JP 1994-186052 19940808

IC ICM H01M010-38

ICS H01M002-30

AB JP 08050920 A UPAB: 19960428

Negative and positive plates (14, 10) consisting mainly of member storable and dischargeable of a **lithium metal**, a **lithium** alloy, or lithium are **laminated** through a separator and are contained in a square case (23). A collecting selva part (13) of at least one of the negative and positive plates is electrically connected to a battery terminal (26) through a lead plate (21), at which a fuse (30) is arranged.

ADVANTAGE - Firing and rupture accidents do not occur.

Dwg.2/9

FS CPI EPI

FA AB; GI
MC CPI: L03-E01B5
EPI: X16-B01F1; X16-F03A

L38 ANSWER 28 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1993-221899 [28] WPIX
DNN N2000-238764 DNC C2000-096470

TI Non-aqueous electrolyte **secondary battery** for
camcorder, comprises **metallic lithium**
foil stuck on **anode**, from which **lithium**
ion gets separated and **deposited** on carbon material during
electrochemical reaction.

DC L03 X16

PA (MATU) MATSUSHITA ELEC IND CO LTD

CYC 1

PI JP 05144471 A 19930611 (199328)* 7p H01M010-40

JP 3030995 B2 20000410 (200028)B 7p H01M010-40

ADT JP 05144471 A JP 1991-308810 19911125; JP 3030995 B2 JP 1991-308810
19911125

FDT JP 3030995 B2 Previous Publ. JP 05144471

PRAI JP 1991-308810 19911125

IC ICM H01M010-40

ICS H01M004-02; H01M004-58

AB JP 3030995 B UPAB: 20000613 ABEQ treated as Basic
NOVELTY - Lithium containing complex oxide of transition metal and
carbon material are used for **anode** and **cathode**.
On electrochemical reaction, **lithium** ions gets separated
from **metallic lithium** foil stuck on
anode beforehand and gets **deposited** on the carbon
material.

USE - Non-aqueous electrolyte secondary battery with
over-discharge-resistant characteristic e.g. **lithium**
secondary battery is used in cordless information
communication apparatus such as portable telephone, camcorder. Also
used as power supply battery for driving.

ADVANTAGE - Over-discharge-resistant characteristic of
battery is raised remarkably, by **depositing**
lithium ions to carbon materials, during electrochemical
reaction.

DESCRIPTION OF DRAWING(S) - The figure shows the
cross-sectional view of component of cylindrical **lithium**
secondary battery.

Dwg.1/5

AB JP 05144471 A UPAB: 20000617

NOVELTY - Lithium containing complex oxide of transition metal and
carbon material are used for **anode** and **cathode**.
On electrochemical reaction, **lithium** ions gets separated
from **metallic lithium** foil stuck on

anode beforehand and gets **deposited** on the carbon material.

USE - Non-aqueous electrolyte secondary battery with over-discharge-resistant characteristic e.g. **lithium** secondary **battery** is used in cordless information communication apparatus such as portable telephone, camcorder. Also used as power supply battery for driving.

ADVANTAGE - Over-discharge-resistant characteristic of **battery** is raised remarkably, by **depositing** **lithium** ions to carbon materials, during electrochemical reaction..

DESCRIPTION OF DRAWING(S) - The figure shows the cross-sectional view of component of cylindrical **lithium** secondary **battery**.

Dwg.1/5

FS CPI EPI

FA AB; GI

MC CPI: L03-E01B5; L03-E01B9

EPI: X16-B01F1; X16-E01C1

L38 ANSWER 29 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1993-155325 [19] WPIX

DNN N1993-118989 DNC C1993-069229

TI **Lithium** sec. **battery** **cathode** alloy
mfr. - by holding **lithium** metal plate between
two aluminium metal plates, and immersing **lamine** plate
in non-aq. organic solvent NoAbstract.

DC L03 X16

PA (FJIC) FDK CO LTD

CYC 1

PI JP 05089872 A 19930409 (199319)* 4p H01M004-02

JP 3304367 B2 20020722 (200409)B 4p H01M004-04

ADT JP 05089872 A JP 1991-274883 19910927; JP 3304367 B2 JP 1991-274883
19910927

FDT JP 3304367 B2 Previous Publ. JP 05089872

PRAI JP 1991-274883 19910927

IC ICM H01M004-02; H01M004-04

ICS H01M004-40; H01M010-40

AB JP 3304367 B UPAB: 20040205 ABEQ treated as Basic

NOVELTY - A **lamine** is formed by pinching a
lithium metal plate (1) between two aluminum
plates (2a, 2b). The obtained **lamine** is immersed in a
non-aqueous organic solvent to obtain a lithium and aluminum alloy.

USE - Used for manufacturing a **cathode** alloy used in
lithium secondary **batteries**.

ADVANTAGE - The generation of bending or warping on a plate of
the alloy is prevented by forming an alloy of lithium and aluminum
using an electrochemical process.

DESCRIPTION OF DRAWING(S) - The figure shows an explanatory diagram of cathode alloy manufacture. (Drawing includes non-English language text).

lithium metal plate 1
aluminum metal plates 2a, 2b

Dwg.1/1

FS CPI EPI
FA AB; GI
MC CPI: L03-E01B5
EPI: X16-B01F1; X16-E01C; X16-E01G

L38 ANSWER 30 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1993-137877 [17] WPIX

DNN N2001-484989 DNC C2001-191541

TI **Secondary battery** has positive electrode, separator, metallic foil and negative electrodes, doped with lithium ion and laminated sequentially and adhered to insulated board and enclosed in metallic can.

DC L03 X16

PA (ASAHI) ASAHU CHEM IND CO LTD

CYC 1

PI JP 05074424 A 19930326 (199317)* 5p H01M002-02

JP 3073809 B2 20000807 (200175)B 5p H01M002-02

ADT JP 05074424 A JP 1991-261392 19910913; JP 3073809 B2 JP 1991-261392 19910913

FDT JP 3073809 B2 Previous Publ. JP 05074424

PRAI JP 1991-261392 19910913

IC ICM H01M002-02

ICS H01M010-40

AB JP 3073809 B. UPAB: 20011220. ABEQ treated as Basic

NOVELTY - **Lithium** ion is doped into positive electrode (3) made from lithium-based complex oxide and negative electrode (4) is made from carbon-based material in which lithium ion is doped. A separator (5) made from carbon-based material doped with lithium and a metallic foil collector is arranged in between the electrodes (3,4) and whole assembly is adhered to insulated board (6) and enclosed within metallic can (2).

USE - **Secondary** battery with high voltage output function.

ADVANTAGE - Simplifies assembling of laminated electrodes into metallic can and provides high energy output with stability.

DESCRIPTION OF DRAWING(S) - The figure shows the partial cross-sectional view of battery. (Drawing includes non-English language text).

Metallic can 2

Positive electrode 3
 Negative electrode 4
 Separator 5
 Insulated board 6

Dwg.1/1

AB JP 05074424 A UPAB: 20011227

NOVELTY - **Lithium** ion is doped into positive **electrode** (3) made from **lithium**-based complex oxide and negative **electrode** (4) is made from carbon-based material in which lithium ion is doped. A separator (5) made from carbon-based material doped with **lithium** and a **metallic** foil collector is arranged in between the electrodes (3,4) and whole assembly is **adhered** to insulated board (6) and enclosed within metallic can (2).

USE - **Secondary** battery with high voltage output function.

ADVANTAGE - Simplifies assembling of **laminated** electrodes into metallic can and provides high energy output with stability.

DESCRIPTION OF DRAWING(S) - The figure shows the partial cross-sectional view of battery. (Drawing includes non-English language text).

Metallic can 2

Positive electrode 3
 Negative electrode 4
 Separator 5
 Insulated board 6

Dwg.1/1

FS CPI EPI
 FA AB; GI
 MC CPI: L03-E01B5
 EPI: X16-B01F1; X16-E01C1

L38 ANSWER 31 OF 32 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1993-079305 [10] WPIX

DNN N2001-467057 DNC C2001-186769

TI Non-aqueous solvent **secondary** battery comprises electricity-generation component comprising integrally **laminated** negative plate containing carbonaceous material, separator and **anode** containing **lithium** complex oxide.

DC A85 L03 X16

PA (RAYN) TOSHIBA BATTERY CO LTD

CYC 1

PI JP 05021068 A 19930129 (199310)* 4p H01M004-62

JP 3062304 B2 20000710 (200173)B 4p H01M004-62

ADT JP 05021068 A JP 1991-175283 19910716; JP 3062304 B2 JP 1991-175283 19910716

FDT JP 3062304 B2 Previous Publ. JP 05021068

PRAI JP 1991-175283 19910716

IC ICM H01M004-62

ICS H01M004-02; H01M010-40

AB JP 3062304 B UPAB: 20011211 ABEQ treated as Basic

NOVELTY - The non-aqueous solvent **secondary** battery (1) has electricity-generation component comprising integrally **laminated** negative plate (5), separator (6) and anode (7). Plate (5) consists of carbonaceous material carrying alkali **metal** mainly **lithium** and polyacrylic acid and a styrene polybutadiene rubber binder. The **anode** contains **lithium** complex oxide as active material.

USE - For electronic devices.

ADVANTAGE - Decomposition reaction between lithium and binder is eliminated and charging-discharging cycle is effectively progressed. Even when the battery repeats charging-discharging cycle, reduction of binding capability, dropping-off and internal short circuiting of the negative plate holder due to the increase in battery internal resistance caused by damaging electroconductivity of a collector and negative plate holder are eliminated. Capacitance maintenance factor is improved. Non-aqueous solvent **secondary** battery having stabilized performance and durability is obtained.

DESCRIPTION OF DRAWING(S) - The figure shows the partial cross-section diagram of the non-aqueous solvent **secondary** battery.

Non-aqueous solvent **secondary** battery 1

Negative plate 5

Separator 6

Anode 7

Dwg.1/2

AB JP 05021068 A UPAB: 20011217

NOVELTY - The non-aqueous solvent **secondary** battery (1) has electricity-generation component comprising integrally **laminated** negative plate (5), separator (6) and anode (7). Plate (5) consists of carbonaceous material carrying alkali **metal** mainly **lithium** and polyacrylic acid and a styrene polybutadiene rubber binder. The **anode** contains **lithium** complex oxide as active material.

USE - For electronic devices.

ADVANTAGE - Decomposition reaction between lithium and binder is eliminated and charging-discharging cycle is effectively progressed. Even when the battery repeats charging-discharging cycle, reduction of binding capability, dropping-off and internal short circuiting of the negative plate holder due to the increase in battery internal resistance caused by damaging electroconductivity of a collector and negative plate holder are eliminated. Capacitance maintenance factor is improved. Non-aqueous solvent

secondary battery having stabilized performance and durability is obtained.

DESCRIPTION OF DRAWING(S) - The figure shows the partial cross-section diagram of the non-aqueous solvent **secondary** battery.

Non-aqueous solvent **secondary** battery 1

Negative plate 5

Separator 6

Anode 7

Dwg.1/2

FS CPI EPI

FA AB; GI

MC CPI: A04-B03; A04-F04; A12-E06; L03-E03

EPI: X16-B01F1; X16-E01C1; X16-E09

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L38 ANSWER 32 OF 32 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 1989-105477 JAPIO

TITLE: **LAMINATED LITHIUM
SECONDARY CELL**

INVENTOR: HANABUSA KOJI; KASHIWAGI TORU

PATENT ASSIGNEE(S): SUMITOMO ELECTRIC IND LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 01105477	A	19890421	Heisei	H01M010-40

APPLICATION INFORMATION

STN FORMAT: JP 1987-263259 19871019

ORIGINAL: JP62263259 Showa

PRIORITY APPLN. INFO.: JP 1987-263259 19871019

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1989

AN 1989-105477 JAPIO

AB PURPOSE: To obtain a **lithium secondary**

cell with a large capacity by providing positive electrodes formed with conducting polymer on one side or both sides of a current collecting plate and negative **electrodes** formed with **lithium** or **lithium** alloy on one side or both sides of a current collecting plate and **laminating** them in turn.

CONSTITUTION: Positive electrodes made of a positive electrode material 2 are provided on both sides of a positive electrode current collecting plate 1 and negative electrodes made of a negative electrode material 4 are provided on both sides of a

negative electrode current collecting plate 3, for example, and they are **laminated** in turn via proper diaphragms 5. Aniline, pyrrole, thiophene, or their derivatives are used for the positive **electrode** material 2, **lithium metal** is need for the negative electrode material 4, the positive electrodes and the negative electrodes are electrically connected to form a parallel-structure cell. The electrode area can be practically increased, and a **lithium secondary cell** with a large capacity can be obtained.

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IC ICM H01M010-40

ICS H01M004-02